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EDITORIAL ANNOUNCEMENTS.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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VOL. XXXIX. No. 17. FRIDAY, OCTOBER 27, 1905.

The President, in a speech made on his southern trip, has reiterated his "unalterable determination" to regulate railroad rates, but with equal and inspiring vigor he has modified his previous propositions in a direction which shows a possibility of his soon being at one with the railroads and the consumers, and at odds with the organizations of shipping corporations in Cincinnati, Chicago and St. Louis, who assume to represent a public demand. Instead of giving his countenance to the crude Esch-Townsend proposition to have rates fixed absolutely, by the Interstate Commerce Commission, he recommends the prescribing of maximum rates; and by an "administrative body." Leaving the railroads free to make reductions does away with an element of rigidity which would have been fatal to reasonable regulation. An "administrative body" can be constituted which would be free from some of the chief objections to the Commission. Does the President mean that he is ready to join in establishing such a body? Instead of asking Congress to authorize the establishment of new rates "immediately," Mr. Roosevelt now says that the orders should go into effect within a "reasonable time"; which time might well be fixed so as to allow some opportunity for review by a judicial body. Surely here is a hopeful opportunity for agreement on a reasonable provision. The President also says in plain English that the Sherman anti-trust law, as it was applied to the Trans-Missouri and the Joint Traffic Associations, is unwise and needs amendment. The country has been waiting for a powerful leader of public opinion to say this. Finally, by the mouth of the Secretary of War, at Akron, Ohio, the President says that the Government, in prescribing rates, may reasonably limit the effect of an order to a term of one or two years. In this utterance the administration gets to particulars in an encouraging way; much more encouraging than when it is listening to the demands of shippers' organizations which ask for what they call justice, but which is really discrimination in favor of their own cities. The weakness of President Roosevelt's address is the omission to tell how the admitted delays of the law are to be cured. He recognizes the right of appeal—and, of course, the railroads and probably the shippers will frequently appeal—but does not indicate how to settle the problem of getting the courts to decide in shorter time questions which are now held up for years. Secretary Taft's weakness is in believing that a promise from this administration, to disturb rates only with care and caution, can reasonably be accepted by the public as binding on all future administrations. One thing in Secretary Taft's speech needs explanation: He justifies putting the burden of proof on the railroads by saying that they can expedite cases in the courts better than the Government can. If this is a reflection on our judiciary, it is a grave, serious charge. If it is a reflection on the Attorney-General, the remedy is, without additional legislation, within the power of Government.

The fact, made public at Washington last week, that the Armour Car Lines have entertained claims for $140,000 for loss of fruit in the Southern States this year, because refrigerator cars could not be promptly provided to carry it to market, and that $80,000 of this sum has been paid, goes to show that the private-car owners' soft snap has its hard spots. Insofar as it shows that the risks of the business reduce the profits to a reasonable figure, it will tend to disarm the widespread criticism of the private-car business. But until the whole method of working of the private-car lines is made public, as railroad companies' business is made public, people will be inclined rather to the view that these large losses have been cheerfully borne with a view to insuring freedom from criticisms, which, if allowed to become public would lead to an investigation disclosing profits so enormous as to make these damage claims look small. That the income, or expenses, of the refrigerating business, or both, may thus be violently affected by emergencies only serves to emphasize the need of requiring complete publicity of this public service.

There is called to our attention a singular difficulty on some western railroads using automatic stokers in their locomotives. In particular cases, where Illinois and Iowa coal is used, there seems to be no difficulty in getting the coal into the firebox and getting it into the right place; but, due to causes apparently unknown or undiscovered, the flues become honeycombed. The means so far tried to prevent it have been unsuccessful. Is it due to the kind of coal used or is it due to combustion results of such uniform and even distribution of the coal in the firebox as is given with the automatic stoker? Under ordinary circumstances a scraper can be put in the door and the honeycomb scraped from the flue sheet. But the stoker is in the

way. It occupies a part of the door space so that it makes it inconvenient to use the scraper. Some roads have experimented with a sand blast thrown against the flue sheet to cut the honeycomb. Others have used crude oil to form a soot on the flue sheet to prevent the gathering of the honeycomb. Others have tried limestone laid on the grates next to the flue sheets to prevent the formation. Still others have used kerosene to make a fire hot enough to burn off the honeycomb. Perhaps some readers who have had experience, or have any theories to suggest in the matter will find interest in this subject.

The Car Service Committee of the American Railway Association has recommended an increase in the rate per day for the use of freight cars interchanged of 25 per cent.; that is, from 20 cents a day to 25 cents; and the Association has adopted the recommendation. This means that a formal vote will soon be taken by letter, and, no doubt, that the change will be put in effect a few months hence. For cars held beyond 30 days by one road the rate (after 30 days) will remain as now, one dollar a day. The adoption of the 25-cent rate will be a decided advance toward justice and equity. Twenty cents is unquestionably below the average cost of the service of a car for a day, and the most elementary business sense dictates that the rate be made at least as high as the actual cost, unless there are important reasons for not doing so, which is not the case. In view of the pronounced differences of opinion on the question and the numerous difficulties, the committee must be credited with both diplomatic ability and a good quality of grit. Roads which, like the New York, New Haven & Hartford, borrow more cars than they lend, and have a heavy share of terminal business will suffer, as they did when the 20-cent rate was adopted; but now, as then, will probably have to put up with suffering, for the general good. Now, as then, the only remedy is to be found in readjusting transportation rates and in making consignees pay for unreasonable detention of cars. This great burden on delivering roads is to be looked at, not as the result of the pernicious activity of revolutionary car-service theorists, but as a necessary correction of wrong business methods. Roads which desire to make the rate 30 or 35 cents, or higher, also had to be considered, no doubt. But in spite of the persistent and multifarious defects which constantly annoy the transportation officer—the unreasonable impositions of the private-car owners, the need of adjusting the rate to the capacity of the car, and the troubles of embargoes, accumulations of empty cars and dishonorable neighbors—a single arbitrary rate has the great and unique advantage of simplicity; and the 30-cent advocate, like the New Haven 13-cent advocate, can do the greatest good by acquiescing, as gracefully as possible, in the will of the majority.

DIRECTORS' RESPONSIBILITY FOR "LEGAL EXPENSES."

Officers of most corporations have at times to decide, or ask their directors to decide, whether or not they shall pay for protection against hostile legislation, threatened suits, or other action which will cause a loss to their stockholders. Every man makes his own conscience, or gets along without one; but many men of experience as trustees have concluded that they may justifiably do for those whose interests they hold in trust certain things which they would not do for themselves. They say to themselves that their own private notions must not influence their actions to the injury of the owners. There is no use here in discussing the ethics of this way of thinking; we take things as they are. When St. Paul, the most distinguished of the early diplomats, wrote to the Corinthians that he had "renounced the hidden things of dishonesty, not walking in craftiness," he simply announced that the time had come when he could do it.

One of the worst features of this miserable business is concealment and consequent lying. There is no ledger account headed, "Bribe and Blackmail," but such payments are usually buried in advertising or legal expenses. It is occasionally done without the knowledge of the directors, but more often with an intimation and a reluctant nod—a negative approval by some or all of them. They are ashamed as well as afraid to discuss it, and, as honorable men face to face, authorize transactions which they would not dare to make public.

An actual incident is more illustrative than description. We all know plenty of modern ones, but it is well to choose one old enough to be told. As the dressmaker replied to Marie Antoinette, who demanded a gown of absolutely original design: "There is nothing new in the world, except what is old enough to be forgotten."

A few years before the telephone was developed, the Law Telegraph Company was organized in New York to use the Edison printing telegraph instruments as a means of communication between lawyers, and between their offices and the court rooms, in precisely the same way that the telephone exchanges are now operated. The necessary number of subscribers was secured, but it was essential to the success of the scheme to have an instrument in each court house in the city. The Board of Aldermen was asked for a permit. It was a public benefit, expediting the business of the courts, and saving the time of lawyers and the money of their clients. The request was referred to "Billy" Maloney, Clerk of the Board and unofficial agent for the "Combine" which later dealt with Jacob Sharp in the matter of the Broadway railroad franchise. Billy said the permit would cost $1,600; and unblushingly explained that this sum included $100 each for thirteen aldermen, $100 for the "Organization" (Tammany Hall), and $200 for himself. This last because he had to divide with some one "higher up." The manager, being inexperienced, called a meeting of his board of directors and presented the whole case to them for decision. It is nearly, if not quite, true that if he had privately asked these directors separately they would have advised him to do the best he could, and say nothing about it; but they could not look each other in the face and officially take such action. They refused to pay blackmail, and resolved, if necessary, to dissolve the company and stand their losses. This stubborn attitude, and a good deal of diplomacy, secured the permit and avoided the crime.

This is recalled because it is typical, we believe, of the methods of the great majority of the corporations in this country. It would seem to be the plain duty of the directors, not the officers, to take the responsibility when the company's business success is put in peril by strikers. When there is an impasse, they are the ones to decide whether the law or their trust is to be violated.

The other extreme from the case above cited, is to have an officer or agent in charge of "legislation." The publicity given to this method by the insurance companies investigation, although long known to every man of affairs, has shocked the public and jarred many directors. Carrion breeds maggots no faster than such a disbursing agent breeds blackmailers. The limit in his game is that of the poker player, his available cash, and when he has disbursed the liberal allowance of his company he says to the striking legislators: "That's all, boys; all I've got for you this year." Then the strike-bill business has a dull season, and the agent has rest until near election time, when the friends of the company need election expenses. "We have found," said Mr. Jay Gould in his testimony before the Erie Railroad investigating committee, "that it is cheaper to make legislators than to buy them." Mr. T. C. Platt's testimony, based on long experience in this industry, would not presumably be dissimilar.

There is what seems a better course, adopted by some large corporations, which, from the nature of their business, are peculiarly subject to hostile legislative action in the various States of the country. The method, in brief, is publicity. The menace is met, but met in the open, and the expenditures necessary are made in such a way that their purpose cannot be misconstrued or misunderstood. Appropriations are made for definite periods of time, and the expenditures are put in the hands of a special committee. Expenditures are made under the direction and supervision of that committee. Payments are made by check, and detailed vouchers reciting exactly the purpose for which the money was spent, and, of course, giving the name of the people to whom the money was paid, are taken in every case. All these expenditures are subsequently reported to the full board, and when the appropriation is exhausted, no further expenditure can be made without additional action by the board. This method must necessarily eliminate about all the items which might with propriety otherwise be called doubtful.

A corporation which does business in many states is certain to face the necessity for considerable expenditures in connection with proposed legislation, but that these expenditures have taken on a doubtful character in the experience of nearly every such corporation does not prove that all such expenditures are unnecessary or improper. They are necessary, and the expenditures may be made in a perfectly proper way. There is nothing the striker and blackmailer is so much afraid of as daylight. He doesn't like to indorse a check or sign a voucher. If he has to do both, it is pretty certain that he rendered a legitimate service in return for a legitimate expenditure.

In referring to this subject there is no intention to do any preaching, nevertheless, we might go so far as to mention that a good many successful folks think that honesty is the best policy; and also to suggest that the direction in which to work for a remedy is toward the greatest feasible publicity. Sunlight kills germs.

WHERE SOME GROSS EARNINGS GO.

A Comparison.

Last year, the gross earnings of the Chesapeake & Ohio increased $1,426,846 and its net earnings $959,070. The Norfolk & Western increased $1,370,283 in gross and only $429,177 in net. In another column, the principal statistics of these two roads are grouped for comparison because of their wonderful similarity, and it seems well to examine further here to find why the C. & O. got more net earnings than the N. & W. out of nearly the same increased gross earnings. The C. & O. found it necessary to add to its expense account only $467,800. The N. & W. increased its operating expenses by $941,100. Unfortunately for a close comparison, the two companies use different detailed classifications of expenses, but it is not hard to draw some conclusions from the general classification. As a back-ground for comparison and in order to approximate a standard, results on seven other roads, comparable on account of their similar situation or traffic, are included in the examination.

Increased business, especially low-grade traffic (coal and coke tonnage increased 26 per cent. last year on the C. & O. and 20 per cent. on the N. & W.), naturally shows its immediate and greatest effects first, on conducting transportation, the actual cost of getting and moving the business; second, on maintenance of equipment, the keeping in serviceable condition of the immediate physical agencies which carry it; third, on maintenance of way and structures, the up-keep of buildings and roadbed; and last, on general expenses, the cost of management. As expenditures accompanying an increase in business vary from this general order, variations from the normal in the spending policy of a management may generally be determined.

There were changes last year in the amounts spent by the C. & O. and the N. & W. in each of the principal expense accounts as compared with the preceding year as follows, all but two of the figures being increases:

	Chesapeake & Ohio.	Norfolk & Western.
Maintenance of equipment	Inc. $419,000	Inc. $366,300
Conducting transportation	Inc. 257,000	Inc. 323,000
Maintenance of way	Dec. 118,800	Inc. 241,800
General expenses	Dec. 88,600	Inc. 10,000

These figures must, of course, be reduced to percentages for a fair comparison as in the following table, which includes also the percentages of increase in gross earnings:

	Chesapeake & Ohio.	Norfolk & Western.
Gross earnings	Inc. 7 per cent.	Inc. 6 per cent.
Maintenance of equipment	Inc. 11 per cent.	Inc. 10 per cent.
Conducting transportation	Inc. 4 per cent.	Inc. 5 per cent.
Maintenance of way	Dec. 5 per cent.	Inc. 8 per cent.
General expenses	Dec. 22 per cent.	Inc. 2 per cent.

The striking fact is that on neither road did conducting transportation or general expenses increase as fast as gross earnings. This is only another way of saying that more was spent on maintenance.

From an operating standpoint, the Chesapeake & Ohio shows the better results, with an increase of only 4 per cent. in conducting transportation and a decrease of 22 per cent. in general expenses to take care of a 7 per cent. increase in gross earnings. Conducting transportation on the Norfolk & Western increased 5 per cent. and general expenses 2 per cent. against an increase of only 6 per cent. in gross. In maintenace expenditures, however, the Norfolk & Western makes the more satisfactory showing. Both roads increased their maintenance of equipment expenses very largely and to about the same extent; but in maintenance of way expenditures the Norfolk & Western shows an increase of 8 per cent. against a decrease of 5 per cent. in the same expenditure on the Chesapeake & Ohio.

It was in maintenance of way, evidently, that the Chesapeake & Ohio made its largest saving. The policy of the management toward this account was to a great extent responsible for the showing in net earnings at the end of the year. It is at once interesting to observe whether this saving was justified. In 1904 the Chesapeake & Ohio spent on maintenance of way $2,308,000, or $1,398 per mile. In that year expenditures on the line by the Norfolk & Western amounted to $2,854,000, or $1,657 per mile. Last year the margin between them in this important item was widened, the Chesapeake & Ohio spending only $2,189,000, or $1,308 per mile, against an expenditure by the Norfolk & Western of $3,096,000, or $1,657 per mile. This is a difference of $900,000, or over $400 per mile in roadway expenses, which seems a very great difference on two roads so similarly situated. The 1904 figures, and especially the very large expenditures on roadway made during the past few years by the Norfolk & Western, show that this state of affairs is not an exceptional one due to unusual conditions. It looks as though the Chesapeake & Ohio were not spending enough for maintenance of way to keep its line in first rate condition to carry its heavy traffic. This is further borne out by comparison with the other roads which have been selected, on which maintenance of way cost the following amounts per mile; the figures in each case being from the last annual report:

Baltimore & Ohio	(1904)	$1,702
Chicago & Eastern Illinois	(1905)	861
Delaware & Hudson	(1904)	2,046
Erie	(1905)	1,652
Hocking Valley	(1905)	1,921
Lehigh Valley	(1905)	2,345
Philadelphia & Reading	(1905)	2,698
Average, seven roads		1,889
Chesapeake & Ohio	(1905)	1,308
Norfolk & Western	(1905)	1,721

With the exception of the low figure on the Chicago & Eastern Illinois, no other road spent within $300 per mile so little as the Chesapeake & Ohio, and only the Erie and the Baltimore & Ohio spent less than the Norfolk & Western. It must be taken into account, however, that both the Virginia roads have little double track compared to, for instance, the Lehigh Valley or the Reading, and also that the large expenditures on both lines in recent years would naturally have the effect of reducing current maintenance figures. On the other hand—and this applies to maintenance of equipment as well—the heavy train loads (585 tons on the C. & O. and 531 tons on the N. & W.) and a freight traffic density of over 2,000,000 ton miles per mile of road on each railroad, mean heavy service charges in both classes of maintenance. A fair conclusion, therefore, seems to be that the Chesapeake & Ohio could, with advantage, enlarge its roadway expenditures to at least the Norfolk & Western's figure, without being accused of attempting to conceal earnings in the right of way.

On equipment up-keep they stand more nearly on an even footing, but the position of the two roads is reversed. The Chesapeake & Ohio with its smaller traffic spent for maintenance of equipment more, absolutely, and per each equipment unit than the Norfolk & Western. The figures are $4,078,000 (30.7 per cent. of total expenses) on the Chesapeake & Ohio against $3,917,000 (26.8 per cent. of total expenses) on the Norfolk & Western. The following table shows the expenditures and those of the seven other roads per unit of equipment:

	Maintenance of		
	Locomotives, per locomotive.	Freight cars, per car.	Passenger cars, per car.
Baltimore & Ohio	$2,783	$59	$630
Chicago & East. Ill.	2,609	35	641
Delaware & Hudson	2,097	50	455
Erie	3,318	50	629
Hocking Valley	2,767	61	554
Lehigh Valley	3,394	54	745
Philadelphia & Reading	2,907	66	541
Av'ge, seven roads	2,839	54	598
Chesapeake & Ohio	2,381	100	947
Norfolk & Western	2,304	53	722

These are not the figures given by the companies, but are the sum of the amount directly expended for repairs and renewals of each class of equipment and a proportionate share, for each class, of the other maintenance of equipment expenses, such as superintendence. Here the Chesapeake & Ohio and Norfolk & Western make a better showing in the general comparison than in maintenance of way. Both fall short of the average per equipment unit of the other roads in maintenance of locomotives and the Norfolk & Western in maintenance of freight cars. On the other hand, the Chesapeake & Ohio spends much more than any other road per freight car and per passenger car, and the Norfolk & Western more than any except the Chesapeake & Ohio and the Lehigh Valley per passenger car. The most striking figure among the unit charges is the Chesapeake & Ohio's maintenance charge of $100 per freight car, an increase of $10 per car over 1904, which is $34 more than the next largest expenditure by any road and nearly twice as much as the general average. There is a chance to do some thinking on the following comparison: The C. & O. earned $3,894,000 with 255 passenger cars, with a maintenance cost of $947 each; while the N. & W. earned $3,159,000 with 324 passenger cars with a maintenance cost of $722 each.

The most accurate test of general operating efficiency is the cost of conducting transportation. These are current expenditures which generally have no effect on the future. They are the butchers' and grocers' bills of a railroad. Last year they were on the C. & O. 32.2 per cent. of the total earnings, and on the N. & W. only 29.6 per cent. Combining conducting transportation and general expenses to represent the total of what, as opposed to maintenance, we may call the non-productive expenditures,

on the C. & O. the two together took 33.7 per cent. of the total earnings against 31.6 per cent. on the N. & W.

Comparison with the other coal carrying roads will show how their efficiency in this respect compares with the general showing. The following table shows the percentage of conducting transportation to total operating expenses and the percentage of the two "non-productive" accounts to total earnings. Taxes have in all cases where necessary been eliminated from operating expenses. The numbers in parentheses show the relative positions of the nine roads in economy of the non-maintenance expenses.

	Percentage conducting transportation	
	To operating expenses.	Plus general expenses to gross earnings.
Baltimore & Ohio	56.7 (6)	40.7 (7)
Chicago & Eastern Illinois	60.6 (9)	44.7 (9)
Delaware & Hudson	58.4 (7)	36.8 (6)
Erie	58.5 (8)	42.9 (8)
Hocking Valley	46.6 (1)	31.9 (3)
Lehigh Valley	53.8 (5)	34.4 (5)
Philadelphia & Reading	53.3 (4)	30.1 (1)
Average, seven roads	55.4	37.4
Chesapeake & Ohio	50.4 (3)	33.7 (4)
Norfolk & Western	48.8 (2)	31.6 (2)

The good margin between the C. & O. and N. & W. percentages and the general average of the other roads is proof of a high order of operating efficiency, which is amply corroborated by the figures for train load and traffic density.

Had maintenance charges been skimped while gross earnings were growing larger, it would have been easy for either company to show much larger net earnings for the year, but in that case it would be natural to assume that neither was taking advantage of prosperity to fortify itself for the larger traffic of the future or the slim earnings of some possible panic year to come. But when the large increases in gross earnings are met with still larger proportionate expenditures for maintenance, and conducting transportation does not increase as fast as earnings, it is safe to conclude that both roads are being put on a secure footing for both good times and bad. The difference then in net return means simply that one company has devoted more of its earnings to productive maintenance expenditures than has the other. The Chesapeake & Ohio decreased maintenance of way expenditures in face of increased business, but on the Norfolk & Western both classes of maintenance increased faster than gross earnings.

September Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of September, printed in another column, contains accounts of 24 collisions and 17 derailments. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

		Killed.	Injured.
5th	Brush, Colo.	3	15
7th	Obion, Tenn.	4	4
8th	Zeeland, Mich.	3	0
9th	Tabor Junction, Pa.	3	0
16th	Kimmel, Ind.	2	20
17th	Ironton, Mo.	3	12
21st	Moor's Mill, Pa.	6	10
25th	Paoli, Pa.	6	21
25th	Woodstock, Ala.	1	27
27th	Glenwood, Ind.	1	8

The most fatal accidents in this list occurred not far apart, and almost on the same day—at Moor's Mill and at Paoli, both in Pennsylvania. In the Moor's Mill collision the man in charge of the train at fault was a trainmaster; and the coroner's jury found that the collision was due to his gross and wanton neglect. "Notwithstanding his knowledge that the passenger train No. 10 had the right of way, and that according to schedule it was then due at the point of collision, he recklessly endeavored to reach Moor's Mill, a station two miles west of the accident. We also find that he had full control of the pay train which he was piloting, and that his wanton and reckless conduct was all the more inexcusable, because of his official knowledge and control of the trains of this division."

The Paoli collision was due to the failure of the engineman of the express—one of the most important trains on the road—to heed a stop signal; and most critics will conclude that this failure is to be charged to habitual dependence on the sight of a clear track instead of on the indications of signals. The engineman saw the train ahead of him; he saw that it was clear of track No. 2 (on which the express was entering); he had seen an accommodation train (not this one) at the same place frequently before; he knew that in the ordinary procedure the signals would be cleared through to the east end of the yard for him immediately after the passage of the accommodation train, and so he assumed that the ordinary procedure had been carried out in this case. This train of thought or reasoning may have been partly unconscious, or so rapid as to be substantially so; and yet it is just the thing which must be guarded against. The moral is, simply, to trust *nothing* as a substitute for a signal indication. The signals at Paoli are on signal bridges, and the line of the road is straight. There is a theoretical objection to an arrangement, like that at this place, where fast trains are habitually run at pretty good speed without the benefit of clear distant signals. The crossovers may be traversed at 50 miles an hour or faster, so that when the view is clear it is necessary to slacken the speed but little. This practice impairs the force of the under-control rule; for it is easy for a runner to fall into the mental habit of assuming that where he is allowed to run fast the way has surely been cleared for him. To provide a separate distant signal for the route through the crossover, or separate distants for each of the successive home signals is, however, objectionable, and therefore there seems to be no better recourse than to the more perfect enforcement of our present rules; the simple but difficult problem of perfect discipline. The query arises whether surprise checking has been sufficiently tried in situations like that which this occasion developed at Paoli.

The number of electric railroad accidents reported in the newspapers in September was 20, in which 21 persons were killed and 247 injured. These figures include the disaster on the elevated road in New York City, September 11, which was reported in the *Railroad Gazette* of September 15 and 22. The negligent motorman has not been arrested, and so there have been no further developments; though the newspapers asserted, a week or so after the accident, that the motorman had been seen in Philadelphia and could be arrested if wanted. This accident accounts for 12 of the killed and 50 of the injured. In a butting collision of electric cars, one a passenger and one a freight car, near York, Pa., on the evening of Sept. 9, four passengers were killed and 50 injured.

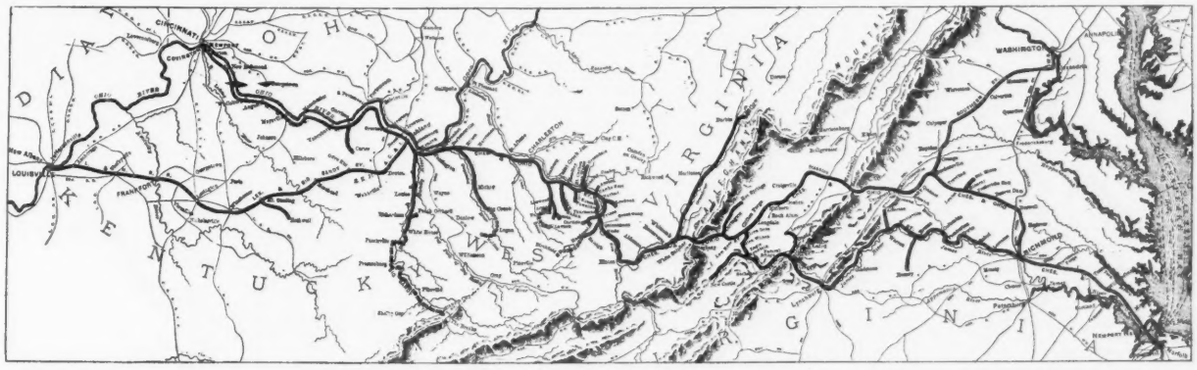
Chesapeake & Ohio and Norfolk & Western Compared.

In mileage, location, traffic and operating problems the Chesapeake & Ohio and the Norfolk & Western are remarkably alike. Both are coal carriers and run from the Atlantic seaboard at Hampton roads, across the Blue Ridge and the Alleghenies, to the Ohio river at Cincinnati. Both are roads which, from the nature of things, must be run on a narrow margin of profit; their solvency depends on reducing expenses below the very low rates received. In many ways, therefore, the annual statements of the two companies, lately issued, furnish material for a comparison.

The Chesapeake & Ohio runs from tidewater at Newport News to Cincinnati and to Frankfort, Ky., whence it enters Louisville over the Louisville & Nashville. From a point west of Richmond, on the more northern of its two lines across the Blue Ridge, it reaches Washington over the Southern Railway tracks. The original Chesapeake & Ohio company was formed in 1868 to consolidate the Virginia Central, one of the oldest of the Virginia roads, and the Covington (Va.) & Ohio, which was undertaken by the state of Virginia as a western connection for the Virginia Central, and on which, before the opening of the war, some $3,000,000 had been spent. Five years later, in 1873, the Chesapeake & Ohio Railroad failed to make its interest payments and in 1878 it was reorganized as the Chesapeake & Ohio Railway. The road was at that time controlled by Mr. C. P. Huntington, who some years later organized, under the laws of Connecticut, the Newport News & Mississippi Valley Company, an early development of the modern "holding company." In 1886 this company leased the Chesapeake & Ohio for 250 years and also two other allied companies. One year later, after default, receivers were appointed for the Chesapeake & Ohio, thus severing its lease to the Newport News & Mississippi Valley Company, which a few years later disappeared entirely. With the reorganization of the Chesapeake & Ohio in 1888, control passed from Mr. Huntington to a five-year voting trust which included Mr. J. P. Morgan, and was generally assumed to be in the interest of the Vanderbilts. Mr. Melvile E. Ingalls, President of the Big Four, was elected President of the Chesapeake & Ohio also, and the two companies became very closely allied.

The road turned over to the new owners was in wretched physical condition and all departments were thoroughly run down. A large part of the track had never been ballasted. The state's expensive work in railroad building across the mountains, however, could not be destroyed by misuse nor fail to be a permanent asset. The colossal character of much of this work is illustrated by two fills, together containing 2,000,000 cubic yards, the larger containing 1,100,000 cubic yards, said to be the largest fill in the world. The rock cutting was tremendous, a stretch of 17 miles, including a tunnel, across the Blue Ridge, having cost $100,000 a mile, and another section of 22 miles having cost $4,000,000. The first important step in putting the property on its feet was the completion, on Jan. 1, 1889, of the Ohio River division to Cincinnati. A few months later the Richmond & Allegheny was acquired. This gave the Chesapeake & Ohio its wonderfully favorable second line from Clifton Forge, in the valley between the Alleghenies and the Blue Ridge, across the Blue Ridge to Richmond, and a continuous low-grade line from Cincinnati to Newport News. At once a much more economical han-

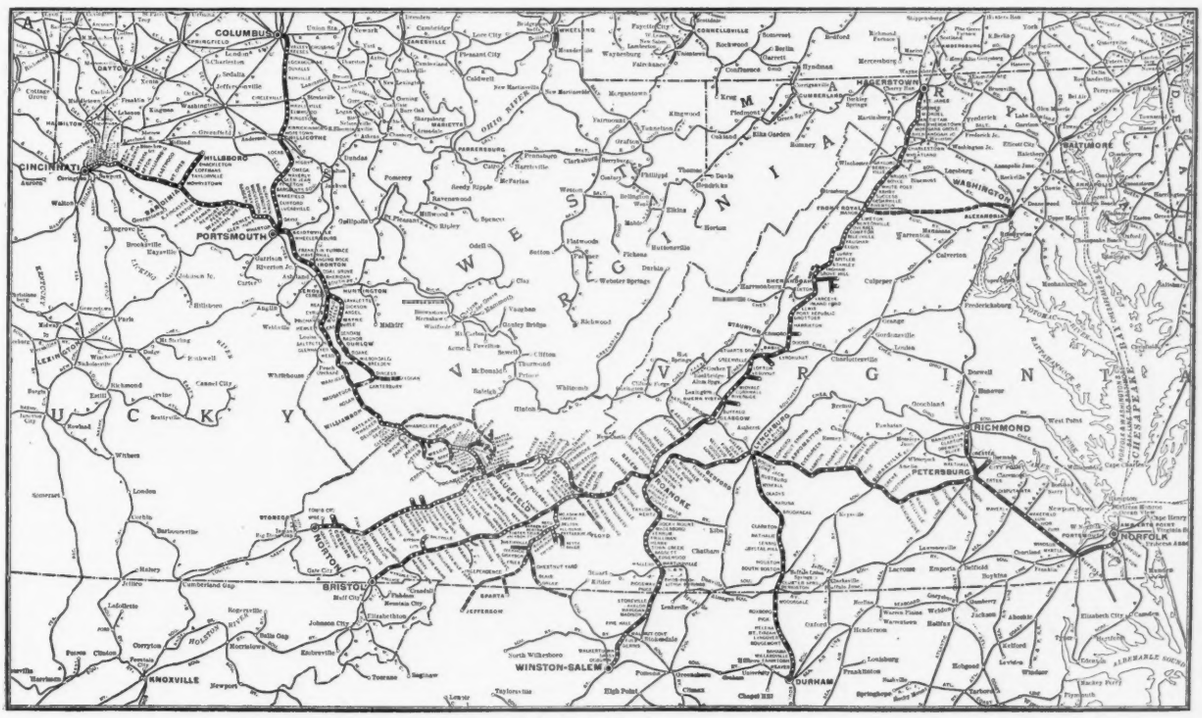
dling of traffic was made possible. On the whole road expenditures were large and the work done was of the highest standard. In 1890 there was included in operating expenses for betterments, $900,000, which left net earnings just sufficient to pay fixed charges and taxes, well illustrating the policy of the new owners to use, in improving the property, every cent available. During the next two years $1,300,000 was similarly taken from net earnings for improvements. The results of this policy were soon evident, gross earnings in 1892 ($9,004,000) being twice what they were in 1887 under the receivership. Though at the end of the receivership trains enough to earn interest on the debt could scarcely be moved over the road, after 1890 the Chesapeake & Ohio began boldly to enter the field as a trunk line competitor. At Newport News, grain elevators and a tidewater terminal were built and a steamship line to England established. The road could carry grain very cheaply—none more so—and at times was suspected of carrying it more cheaply than was sufficient to pay even operating expenses. Its rate cutting during this period of competition caused severe losses to the other trunk lines. As a result of the splendid operating condition to which the property had been brought, it came through the panic years following 1893, when seemingly more powerful roads were going to the wall, without default or foreclosure. Control is now in the hands of the Pennsylvania and the Morgan-Vanderbilt interests, who, together, own a majority of its stock and are directly represented by six of its nine directors.



Chesapeake & Ohio.

The Norfolk & Western serves much the same territory and has a similar history. Like the Chesapeake & Ohio it is controlled by trunk-line influence, the Pennsylvania in 1900-1901 having acquired control by purchase of over $32,000,000 of its common stock. The line runs from Norfolk, Va., to Cincinnati and Columbus, with branch lines reaching south, two of them into North Carolina; and a line from Roanoke, Va., to Hagerstown, Md., where it connects with the Cumberland Valley to Harrisburg, thus forming a through line, under Pennsylvania control, from the Virginia coal fields to Philadelphia and New York. The original companies from which the Norfolk & Western has grown were chartered previous to 1852 and were controlled by the state of Virginia. They were consolidated in 1870 as the Atlantic, Mississippi & Ohio, which ran from Norfolk to the Virginia-Tennessee line, with a total mileage of 428 miles. In 1876 the consolidated company having defaulted on its bonds, it was put in the hands of a receiver and was in 1881 reorganized as the Norfolk & Western. The reorganized company remained solvent longer than the Chesapeake & Ohio after its corresponding reorganization in 1878, but was forced into another receivership by the hard times resulting from the panic of 1893, which brought disaster to the ambitious plans of its managers. Their policy was to construct numbers of branch lines as feeders and to build up a very large mineral traffic. On its face, this seems like a wise policy. It was defeated by the heavy increase in capital charges which accompanied it and by the industrial depression. With prosperous times and more modest capital expenditures the road would have undoubtedly remained solvent. In 1892 net earnings showed a margin of less than $40,000 over fixed charges, and in 1893 there was an actual deficit of $543,000. The sharp increase in fixed charges, particularly in car trust obligations incurred for new rolling stock required by the increased coal traffic, together with the deficiency of earnings on new branch lines—always prompt to reflect industrial depression—put the road in 1895 into a receiver's hands. In the next year it was reorganized as the Norfolk & Western Railway, and has since been increasingly prosperous.

Thus both these roads were originally built before the war by state aid, were consolidated soon after the close of hostilities, and in each case, within five years, had defaulted on their interest payments. Each was reorganized and—the Chesapeake & Ohio in 1888



Norfolk & Western.

and the Norfolk & Western in 1896—went through a later reorganization. Each is now controlled in the interest of the trunk-line situation by the strongest of the trunk-line powers.

The total capitalization of the two roads is similar. The Chesapeake & Ohio, which operates 1,673 miles of line, has $87,427 total capital per mile, $49,467 stock, and $37,960 bonds. The Norfolk & Western operates 1,799 miles and has a total capitalization of $85,773 per mile, made up of $37,537 stock and $48,236 bonds.

With its somewhat larger capitalization the Chesapeake & Ohio earns almost exactly $1,000 per mile less than the Norfolk & Western. Its gross earnings for 1905 were $20,724,371 ($12,388 per mile), and the Norfolk & Western's $24,089,260 ($13,390 per mile). These were increases for the Chesapeake & Ohio of $1,426,846, and for the Norfolk & Western of $1,370,283 over the preceding year. With increases in gross earnings so nearly the same, the Chesapeake & Ohio saved $959,070 of the increase for net earnings against $429,177, or less than half as much increase in net on the Norfolk & Western. In other words, while the operating ratio on all business was 63.9 per cent. on the Chesapeake & Ohio, and 60.6 per cent. on the Norfolk & Western, the increased business was handled at the operating ratio of 39.3 per cent. on the Chesapeake & Ohio and 68.7 per cent. on the Norfolk & Western. The net income after fixed charges was 3.37 per cent. on the Chesapeake & Ohio against 2.38 per cent. in 1904; and on the Norfolk & Western 6.30 per cent., against 6.06 per cent. in 1904.

Both roads must carry freight cheaply or not at all. Their problem is to run long trains of low-grade freight and make a profit. With an average revenue for the last two years on both roads of less than one-half cent per ton per mile (0.468 cent), the seriousness of this problem is evident. Unless the expense of handling per ton mile can be reduced below that figure, they may just as well go out of business. This narrow margin of profit calls for the most economical management. It has necessitated large improvements in roadbed, the use of the most modern equipment, and remarkably large train loads.

During recent years, the train load figures of both companies have shown a wonderful increase. In 1890, for instance, on the Chesapeake & Ohio, the revenue train load was 225 tons; in 1896, what was then remarked in the *Railroad Gazette* as the very extraordinary figure of 325 tons; in 1899, 425 tons; in 1900, 488 tons, and in 1905, 557 tons. The Norfolk & Western, in 1897, at the end of the first nine months of operation of the reorganized company, was carrying an average train load of 325 tons. This has in seven years been increased to 531 tons. The average train load on both roads has very considerably increased during the past year, from 508 tons to 557 tons on the Chesapeake & Ohio and from 488 tons to 531 tons on the Norfolk & Western. These large train loads go a long way toward accounting for the fact that there is a profit in carrying freight for less than one-half a cent per ton per mile. To make up for its smaller train load, the Norfolk & Western, probably because more of its traffic is local traffic, seems to be able to obtain slightly higher ton mile earnings than the Chesapeake & Ohio. In 1904, it received per ton mile 0.498 cent, against 0.470 cent on the Chesapeake & Ohio, and in 1905, 0.477 cent, against 0.427 cent on the Chesapeake & Ohio.

The number of passengers carried one mile per mile of road last year on the Chesapeake & Ohio was 115,299, against only 78,466 on the Norfolk & Western. The total number of passengers on the Chesapeake & Ohio increased from 176,075,000 in 1904 to 192,838,400 in 1905. On the Norfolk & Western in 1904, there were 136,561,600 passengers carried, and in 1905, 141,159,800. The average distance each passenger was carried was 56 miles on the Chesapeake & Ohio, and 40 miles on the Norfolk & Western, showing that the Chesapeake & Ohio has a considerably larger share of through traffic. This is also borne out by the average revenue per passenger per mile, which was last year 2.019 cents on the Chesapeake & Ohio and 2.238 cents on the Norfolk & Western.

The number of tons carried one mile per mile of road was, on the Chesapeake & Ohio, 2,244,776, against 1,917,741 in 1904, and on the Norfolk & Western, 2,373,674, against 2,223,328 in 1904. The average distance each ton of freight was carried was 282 miles on the Chesapeake & Ohio and 269 miles on the Norfolk & Western.

The large amount of low-grade traffic hauled makes it necessary for both roads to have heavy car trust obligations. For years they have in this way made large purchases of high capacity equipment. Their equipment liabilities are probably as high per mile of road as those of any other road in the country. The amount of equipment trusts outstanding on June 30 was $8,165,000 on the Chesapeake & Ohio, or $4,880 per mile of road, and $7,300,000 on the Norfolk & Western, or $4,058 per mile of road. The Chesapeake & Ohio paid out of income last year $735,000 as principal of equipment trusts, and the Norfolk & Western, $200,000 for the same purpose.

In addition to these payments out of income, both companies made liberal charges against income for improvements. On the Chesapeake & Ohio, such extraordinary expenditures, including $465,000 for new equipment, amounted to $1,217,477, which was charged directly to the year's income account. The Norfolk & Western pays for improvements through a Betterment Fund created out of surplus income year by year. To this fund was charged during the year, for improvements, $1,848,484, while at the same time there was added to the fund out of the year's income $1,000,000. In other words, $848,484 out of surplus income of previous years and $1,000,000 out of current income was expended for extraordinary betterments. In addition, there was charged against the Fund for Acquiring Additional Equipment, new equipment costing $1,440,000, and the $200,000 of equipment trust payments already mentioned. Out of the current income of the year there was added to this fund $1,250,000; or, from the other point of view, $390,000 was spent for new equipment out of the income of previous years and $1,250,000 out of current income. In short, while the Chesapeake & Ohio spent for betterments and new equipment during the past year $1,952,477 out of income, the Norfolk & Western spent for like purposes $3,688,490 out of the surplus income of previous years and charged to current income for future improvements $2,250,000.

There is no need to look further for an explanation of the relative financial strength of the two companies, or a reason for the N. & W. directors' action on Wednesday in raising the common stock dividend rate to four per cent. Both companies are prosperous, but with a funded debt $12,000,000 smaller than that of the Chesapeake & Ohio, the Norfolk & Western not only earns more gross, net and per mile, but spent last year nearly twice as much out of earnings for improvements. As operating properties, both roads are notable as examples of favorable location and the most painstaking of careful management, which has succeeded in making profitable the hauling of low-grade traffic at a remarkably narrow margin of profit.

The principal statistics of operation follow:

Chesapeake & Ohio.	1905.	1904.
Mileage worked	1,673	1,651
Passenger earnings	$3,894,145	$3,648,233
Freight earnings	16,039,313	14,869,188
Gross earnings	20,724,371	19,297,525
Maint. way and structures	2,188,835	2,307,620
Maint. of equipment	4,077,943	3,659,382
Conducting transportation.	6,677,255	6,420,666
Operating expenses	13,250,966	12,783,190
Net income	2,871,639	1,944,511
Betterments chrgd agst income	1,217,477	861,366
Surplus for the year	291,258	5,241

Norfolk & Western.	1905.	1904.
Mileage worked	1,799	1,723
Passenger earnings	$3,158,773	$3,150,859
Freight earnings	20,249,400	18,894,941
Gross earnings	24,089,260	22,718,977
Maint. way and structures.	3,095,910	2,854,164
Maint. of equipment	3,917,268	3,550,968
Conducting transportation	7,136,484	6,813,496
Operating expenses	14,614,434	13,673,328
Net income	5,833,454	5,688,303
Betterments chrgd agst income.	2,250,000	2,000,000
Surplus for the year	449,995	524,719

NEW PUBLICATIONS.

The Panama Canal.—System and Projects of Lindon W. Bates. Published by the Author. Cloth, 180 pages, and 15 plates.

Mr. Lindon W. Bates has made a careful study during his engineering career of the many complex problems involved in the development of deep waterways and canals. Some years ago he began on the collection of data and information relating to the geologic and climatic conditions of the Isthmus of Panama, from which he has evolved two alternative but seemingly equally feasible projects for building the ship canal from the Atlantic to the Pacific with the minimum cost and time. In this monograph he presents the details of these two projects and the reasons for making his claims that they are more meritorious than any which have yet been considered since the French company first conceived this gigantic enterprise. Readers of the *Railroad Gazette* will remember that some months ago (June 2, 1905) an abstract of Mr. Bates' original pamphlet was published, together with two maps showing his plan for harbor improvements and the construction of a lake waterway for most of the distance across the Isthmus. Therefore, an outline of his project is not now necessary. It is sufficient to say that from a casual examination the plan proposed appears to be based on sound engineering principles and worthy of consideration by the Board of Consulting Engineers. It may not be the best plan but it is a good one if we can judge from our own meagre knowledge of the situation and a study of the data presented in this book. The text is accompanied by 15 plates showing the different canal projects which have been proposed and some of the engineering details of Mr. Bates' plan.

TRADE CATALOGUES.

Switchboards.—The Stanley-G.I. Electric Mfg. Co., Pittsfield, Mass., sends its bulletin No. 409, in which is illustrated and described a number of standard switchboards made by this company for use in connection with small direct current electric plants.

Automatic Brake Slack Adjuster.—The American Brake Company, St. Louis, Mo., sends its 1905 part catalogue for the "American" automatic slack adjuster. It is in pamphlet form and is pre-

pared for binding with similar Westinghouse publications. It supersedes the 1901 edition and illustrates various improvements. The preface explains the need of automatic regulation of piston travel and the operation and advantages of the "American" device. The succeeding pages illustrate by plates the details of the various forms for different services and fully explains them. There are nine plates, the last of which chows the method of attachment.

Locomotive Boiler Maintenance.—The Kennicott Water Softener Co., Chicago, sends an attractive pamphlet containing a reprint of the paper on The Locomotive Boiler Water Changing Plant of the Pittsburg & Lake Erie, by Mr. A. R. Raymer, Assistant Chief Engineer of that road, read at the October, 1904, meeting of the Western Railway Club. This paper was printed in the *Railroad Gazette*, Oct. 21, 1904. The Kennicott Company controls the manufacturing and selling rights of the device described in that paper.

Rock Drills and Air Compressors.—The Sullivan Machinery Co., Chicago, sends its Bulletin No. 101. It contains an interesting description and ilustrations of the destruction of Henderson's Point in Portsmouth, N. H., Harbor, on July 22, 1905. The destruction of this point was accomplished by novel methods in which the Sullivan rock drills and air compressors took an important part.

Pipe Crushing and Shearing Machine.—The United Engineering & Foundry Co., Pittsburg, Pa., sends a small pamphlet illustrating a new type of machine for crushing and shearing wrought-iron pipe at one operation. It is intended for use in tube mills, steel plants and scrap yards where large amounts of pipe scrap have to be prepared for reworking.

An Automatic Belt-Tightening Idler.—The Crocker-Wheeler Company, Ampere, N. J., sends its "Flyer" No. 276, which illustrates and describes in detail a newly designed automatic belt-tightening attachment for the Standard Crocker-Wheeler form L Motors. This device is specially adapted for use wherever the limited center distances between pulleys require an increased belt contact on the pulley surfaces.

CONTRIBUTIONS

Forms and Arrangements of Signals.

138 Liberty street, New York, Oct. 17, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

You are doing the railroads and signal contractors a valuable service in ventilating the subject "Forms of Signals." My views on the subject coincide with those expressed by Mr. Salmon in your issue of October 6, and in offering a few suggestions I shall assume the uniform use of semaphore signals. More simplicity and uniformity for the guidance of trainmen are of the greatest importance.

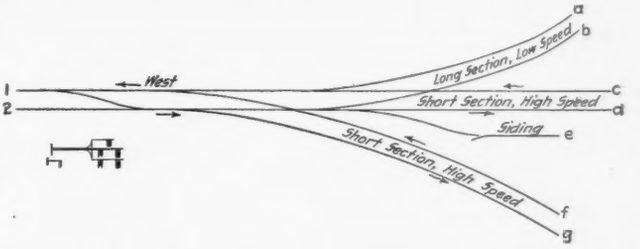
It is quite obvious why it is necessary to distinguish an automatic from a non-automatic signal, but I cannot understand why any further distinction is required for draws and train orders. A red light or a square ended blade means "stop"; "do not pass here," except where the automatic is in use. When train orders are to be given to the trainmen is not the present practice sufficient, viz., bringing the train to a stop at the signal, then lowering it and presenting a hand signal to bring forward the train to the desired point?

Drawbridges might be protected where possible by a turnout track, diverting instead of derailing a train over-running the stop signal. Where this is not practicable, two stop signals might be used, one in the usual position, and the other some few hundred feet in its rear, to give trainmen a chance, in case of an accidental over-run. The best plan of all would be to keep a train back a section when a draw is open.

In the placing of signals they should be so arranged as to render it impossible for there to be any mistake as to the tracks they are intended to govern. The ideal plan is, that every signal shall be in the same vertical and lateral position in relation to its track. Exact uniformity in this respect is obviously impracticable, but this ideal should be adhered to as nearly as possible in all cases.

"Home" or "stop" signals may be either two or three position, but never more than one on one stand or post. A distant signal for the next section may be placed on the same post. At points where two or more high and moderate speed tracks diverge there should be a home signal for each track, each signal on a separate post supported on a bracketed post, and the distant signals similarly arranged. These signals should be as near together as practicable. This arrangement is consistent with the requirements of only one home and one distant signal on one post. One or more of the diverging routes may consist of a short section requiring a distant signal on the home signal post at the point of divergence, and with this plan this can be provided. The curves of some of the routes may be such as to admit of the highest speed being maintained. Another or others may have curves necessitating slowing down. A distinction for these can be provided by elevating the high-speed signals above the horizontal line of the slow-speed signals. Where one of the diverging tracks leads into a freight yard a dwarf signal might be used, placed at the foot of the bracket post and a screen placed before it so that it would be obscured from the sight of the approaching engineer until within any distance that might be determined by conditions of grade and so on.

In signaling parallel tracks the signals should be as far apart

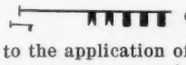
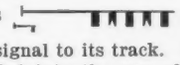


laterally as the distance between track centers. Where space permits separate posts can be used, and in the absence of sufficient space the signals should be supported by a bridge spanning the tracks. Thereby a distinction is maintained between signals for diverging and signals for parallel tracks.

With regard to the distinction between automatic and non-automatic signals, is not the present distinction, a number on the signal, sufficient? It is only when the signal is in the danger position that a distinction is needed. When a signal is in the danger position the engineer is required to stop his train. In the case of an automatic signal he is permitted after a lapse of time to proceed past the signal in its position of danger. During this period of waiting he can surely distinguish, by the presence or absence of a number, whether the signal is automatic or non-automatic.

The arrangement of signals I have here suggested has the advantage of uniformity and is adaptable to the most complex arrangement of tracks as well as a simple one. For instance, let us assume the layout sketched above, showing a suggested arrangement of signals in which all of the signals are for westbound movements on Track No. 2. This arrangement is a common enough practice but is not uniformly adopted by all railroads.

The alternative signal would be, according to some practice, thus

 or thus  with varying rules as to the application of each signal to its track. To avoid a little extra cost some companies are led into the use of obviously mystifying arrangements such as those shown by the two smaller sketches.

Now in regard to the distinction between the home and the distant signal. The distinction at present is obtained by using for night a green light for the distant and a red light for the home. For day a green painted forked blade for the distant and a red painted square ended blade for the home. A signal engineer of long experience and excellent standing on one of the principal railroads in this country has advanced the opinion that this distinction for the day signal is inconsistent, and I think he is right. The fact that the distant signal is simply a cautionary signal has been established by the use of the green light at night. By day a semaphore signal is undoubtedly what is known as a position signal, that is, the blade in the horizontal position indicates "danger." Inclined at about 45 deg. below the horizontal, indicates "caution." Nearly vertical indicates "clear." Therefore the proper distinction for a distant signal is to construct it so that its two positions are, for caution, about 45 deg., and for clear, nearly vertical. Under this arrangement (position, not color being the sign) the blade could just as well be painted red, the most assertive color obtainable. Apologizing for taking up so much of your valuable space, I am, etc.,

HENRY JOHNSON.

The Tax on Alcohol Used in the Arts.

New York, Oct. 24, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A movement is now being carried on by a committee of American manufacturers to secure the removal of the tax from alcohol rendered unfit for beverage purposes. No other national legislation now suggested would be of more value in stimulating the industrial development of this country than the freeing from taxation alcohol rendered unfit for internal use by the admixture of some poisonous substance. Indirectly the railroads of the country would be benefited by the largely increased volume of freight traffic, consequent on the establishment of new industries which cannot now be carried on profitably in this country, owing to the high cost of alcohol,

and the development of many existing industries, the sale of whose products is necessarily limited by the excessive price of this important material.

It is estimated by competent authorities that within a very short time after the enactment of legislation for this purpose at least 100,000,000 gallons of alcohol would be used annually for industrial purposes. This would, of course, mean much additional freight for the railroads, besides the carrying of corn and other products to the distillers.

One phase of this subject, which is of special interest to railroad companies, is that of furnishing an unlimited supply of excellent motor fuel for internal combustion engines, for motor vehicles, power boats and launcnes, and engines for running farm machinery of various kinds. Some of the railroad companies have already begun experimenting with the gasoline engine for rail motor cars, and the American Locomotive Company is about to engage in the manufacture of internal combustion motors.

The price of gasoline has more than doubled within the past ten years, and with the increasing consumption of that material by motor vehicles, power boats, farm engines, etc., coupled with the decreasing supply of petroleum from which the lighter distillates can be secured, there is serious danger of a yet much greater increase in its cost. The supply of alcohol is unlimited, as it can be distilled from corn, potatoes, beet sugar waste, sorghum and many other farm products.

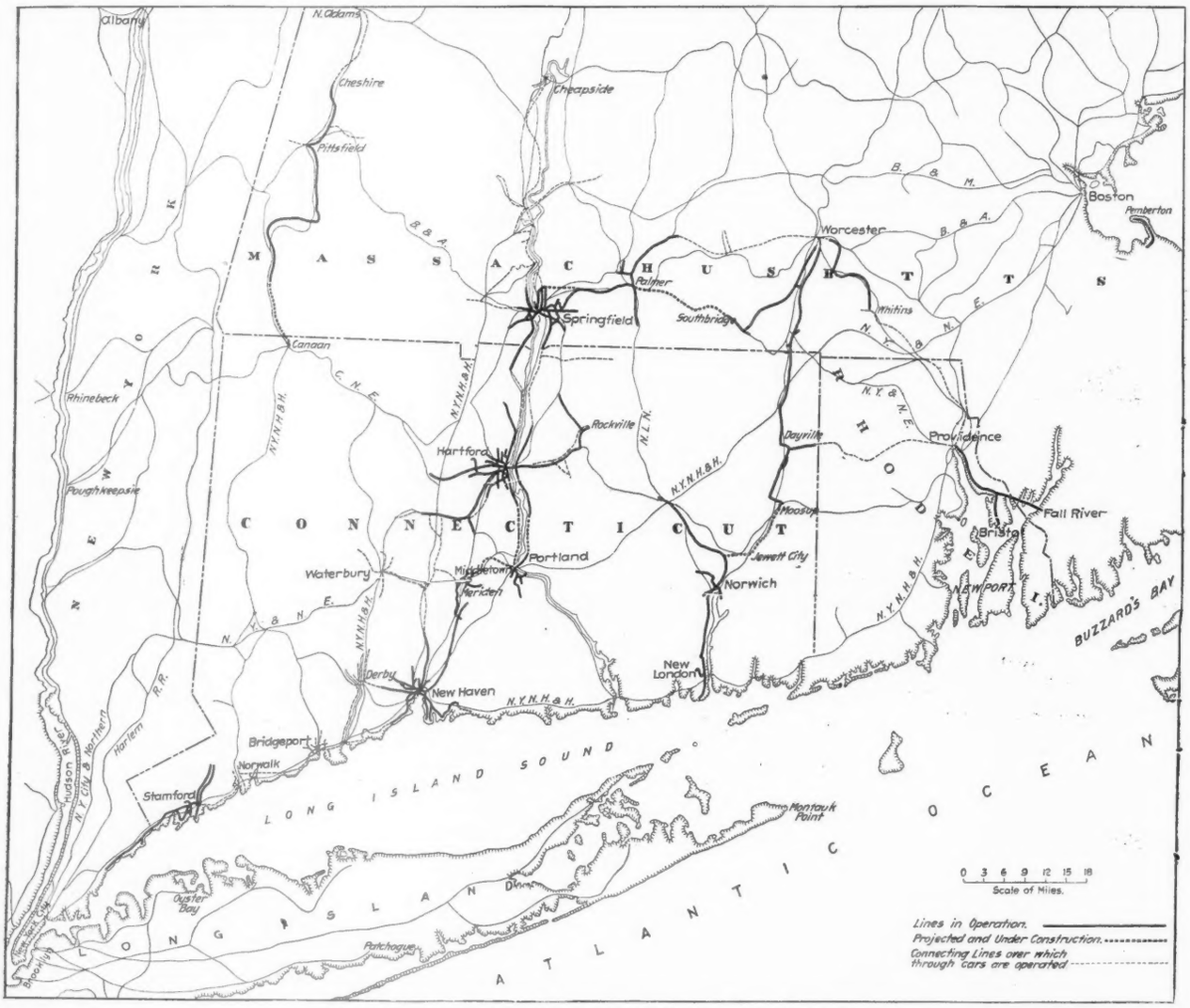
This movement relates wholly to the removal of the internal revenue tax from a domestic material, and has nothing to do with the duty on foreign alcohol.

A matter of secondary interest to the railroads is that considerable quantities of alcohol are used in the manufacture of cars, in the form of shellac varnish, and in all the railroad repair and machine shops, etc. At present, owing to the tax of $2.07 per gallon of grain alcohol, wood alcohol costing 90 cents or $1 per gallon is used. This is an inferior product, and it can only be sold because it is not taxed. Under the proposed legislation denaturized alcohol costing not more than 25 cents, and probably somewhat less, would be substituted for the inferior wood alcohol, thus effecting a considerable saving, and giving a much better material.

HENRY DALLEY, *Chairman.*

The New Haven's Electric Railway System.

The story of the upbuilding of what is now the great electric railway system of the New York, New Haven & Hartford Railroad Company goes back for almost 15 years and includes three pretty distinct periods of which the last has been a rapid and dramatic one. The first period runs back to the early onset of the new trolleys on the old steam road. It was an epoch when a considerable part of the local passenger business of the steam corporation was cut to pieces by the aggressive and advancing trolleys; and it was followed immediately by the keenest antagonism in legislature and courts as the steam corporation fought its long and



The New York, New Haven & Hartford's Electric Lines.

Parthian battle in resisting electric parallels. During this period President C. P. Clark adopted the plan of buying in local trolley systems in Connecticut to break up, if possible, electric parallel projects on a large and, potentially, "long distance" scale. But his purchases were meagre. They included only the Meriden and Stamford street railways—of but some 27 miles taken together and both on the main stem of the steam corporation. To this period belongs also the costly third-rail experiment of Mr. Clark on the Nantasket branch which has been a substantial failure; and the expensive but more successful third-rail line between Hartford and New Britain—with later extension to Bristol—which will be briefly referred to hereafter.

The second period, which included the comparatively brief administration of President John M. Hall, had two electrical features, one of them unique. He electrified by trolley the Providence, Fall River and Bristol lines which have done a large business, especially between Providence and Fall River; and he started a novel venture

in self-parallelism by building a competing trolley line in northeastern Connecticut under the charter title of the Peoples' Tramway Company, paralleling a part of his Norwich & Worcester (steam) division. The project included the construction of large water works for the general supply of electric power and, more remotely, lateral lines to factory villages to furnish a freight business to the Norwich & Worcester, which is essentially a freight road. The enterprise in a narrow and fiscal sense has not been successful even as expanded by President Mellen. But it has served as an important geographical outpost for protection against rival schemes; it has considerable opportunities for profit when extended southward to join the Norwich and New London systems, themselves united by the Montville railway; and it supplied the liberal and expansive charter, later amended with enormous additional powers, which is the basic charter on which almost the whole big electric system of the New Haven corporation rests.

When President Mellen became head of the New Haven corporation two years ago his company owned but three trolley lines—the Stamford and Meriden properties and the Peoples' Tramway line, the whole represented only by about 43 single track miles, those figures not including, however, former steam lines electrified. The policy of the new president was then cryptic. He had been quoted as opposing the whole Clark policy in regard to electrics, but he has stated recently that he disapproved only of the early electrification of steam lines. But his policy very quickly was proclaimed. He entered almost immediately on the purchase of trolleys, especially those of a competing character, and has carried it forward on a scale that has dwarfed not only the accomplishments but the projects of his predecessors. Leaving for later consideration stock and floating debt the annexed table of electric lines now under New Haven ownership or control shows what has been done in the short span of 18 months as measured by track mileage and funded debt:

	Miles of track.	Funded debt.
Constituent Companies.		
Worcester & C. E. Ry.	30.5	$1,992,000
New Haven system	111.6	1,633,000
Meriden system	20.0	500,000
Norwich system	17.0	350,000
New London system	9.0	150,000
Montville Ry.	10.4	250,000
Middletown Ry.	10.4	180,000
Stamford Ry.	18.3	75,000
Greenwich Ry.	9.1	320,000
East Hartford & Glas. Ry.	9.9	200,000
Suffield Ry.	4.7	.....
Branford Ry.	7.2	370,000
Hartford system	75.9	2,810,000
Total	334.0	$8,830,000
Leased Lines.		
Worcester & Webster Ry.	14.9	$150,000
Webster & Dudley Ry.	5.6	30,000
West Shore Ry.	7.4	30,000
N. Y. & Stamford Ry.	16.3	426,000
Total	44.2	$636,000
Controlled Lines.		
Springfield system	87.0	$1,500,000
Worcester & South. Ry.	27.6	700,000
W. & B. V. Ry.	15.7	.....
Berkshire Ry.	40.1	1,000,000
Willimantic Ry.	11.2	240,000
Total	181.6	$3,440,000
Recapitulation.		
Constituent Companies	334.0	$8,830,000
Leased lines	44.2	636,000
Controlled lines	181.6	3,440,000
Total	559.8	$12,906,000

To the funded debt is to be added $12,275,000 of the Consolidated Railway Company, the great holding corporation under which the New Haven Company has financed the 22 tabulated lines with the exception of the Springfield system, which has been financed under a special holding corporation, the "Springfield Railway Companies." The $12,275,000 is represented, mainly, if not entirely, by issues of what may be called a kind of "blanket" debenture but with a proviso that they must be cared for before the substitution of any underlying mortgage—thus giving the security a consolidated mortgage quality. That sum carries the total funded debt up to $25,181,000, about half of it underlying bonds of the merged lines. The figures of mileage, by recent extensions and additions, it is stated officially are carried up to about 588; and, if to this are added electrified steam lines, the total rises to nearly or quite 700 miles. In the street railway lines alone the system inherited by President Mellen has grown from about 43 miles to 588 miles during a year and a half of his administration—figures which, standing by themselves, show the magnitude and boldness of his work.

The task of computing the real stock capitalization is extremely difficult as so much of the original stock of merged corporations has been issued for holding purposes only. The $10,000,000 of Consolidated Railway stock stands, however, against about the same amount of the steam corporation's debentures issued to buy up the New Haven trolley system. The steam company, in addition, has other stocks of the various railway companies amounting to $6,080,170 besides holding $1,212,256 of floating debt, only $78,000 of the latter being in the hands of the public. Owned by the public are also $2,848,300 of stock of the Springfield Railway Companies. Without attempting to squeeze out original water and taking instead actual market values, the appraisal of the 22 merged properties rises considerably above $40,000,000. The first year of operation, incomplete for several of the properties, shows $4,567,978.52 gross, $1,682,356.88 net, and $431,333.65 applicable for dividends from which, deducting $350,000 interest on the steam corporation's debentures a net profit over all appears of $81,333.65—and that after digesting deficits of probably not less than $120,000 in fixed charges of merged lines. For the first two months—July and August—of the present fiscal year the net earnings show a large increase especially marked in the large urban systems as a whole.

A glance at the map will show the motif and coherency of the New Haven's great electric venture. There is a protective outpost in the Berkshires; a long line of electric defence from Worcester southward toward the Sound through eastern Connecticut and soon to be continuous; another through southwestern Connecticut to New York City; and, most important of all, the central fortifications covering New Haven, Hartford and Springfield. Any invading long distance electric line must first pass the flanks and would then find itself practically excluded from the central cities. Two regions of the New Haven steam system are, however, still unprotected. One is Rhode Island, the second the great and intricate system south of Boston, where the former Old Colony system is bunched closely. What President Mellen will do in those uncovered territories is still a question of the future; but enough has been done already to thwart any long distance parallel schemes on a large scale, saying nothing of additional defence obtained by the repeal of the Connecticut general railroad law. An interesting question of the future will be the attitude of Massachusetts as regards the acquisition of trolleys by the steam corporations which was raised but left unsettled by the last legislature of that state. The "Springfield Railway Companies" as a "holding" device may yet supply a test case.

Finally, but by no means least in importance, is the subject of the vantages gained by the New Haven's far excursion into electrics. Those vantages have been along several lines: (1) Harmony of operation between the steam roads and formerly competing electric parallels so as to economize expense and adapt mutually service to traffic. (2) Harmony as to schedules between the electric lines themselves. (3) Centrality of offices and of management doing away with salaries on separate lines—a plan of which has been worked out but has not yet gone into full operation. (4) Economies through the purchase of railway material by large contracts, and (5) simplification of the problems of electrifying short distance steam lines. To illustrate this latter, the question of continuing the third rail on the Hartford-Bristol line changes its bearings now that the steam company owns the Hartford street railway system. All these gains are likely to appear more vividly when two full years of operation of the extensive Consolidated Railway system allows comparison of details. Beyond lies the greater problem of interchangeable traffic when the electric locomotive unifies the street railway with the steam road—an ultimate sharply suggested by President Mellen's coming tentative test of electric locomotives for express passenger traffic between Stamford and New York city.

Circuits for Automatic Block Signals.*

The work of the committee has been the collating of the information called for on blanks which were drawn up by the 1904 committee. The membership for the year 1905 was as follows: E. A. Everett, C. H. Dryden, H. J. Hovey, C. A. Parker and L. R. Clausen. Mr. Clausen was Chairman.

The committee received only 23 answers, and four gave no information. The conclusions relative to the installation, arrangement and maintenance of track circuits are based on a review of the information received.

Relays.

The working parts of relays should be enclosed in transparent dust-proof casing.

A 3,000-volt alternating insulation test should be required between separate insulating parts, and between insulated parts and frame or magnet cover.

Four ohms is a good resistance to use for average conditions, and special conditions may require higher resistance, but it is not advisable to use lower resistance than four ohms.

The following specifications are acceptable:

.06 amp. for raising armature.

.04 amp. at release of armature.

.11 amp. average current through relay in service.

Platinum to carbon front contacts.

Platinum to platinum back contacts.

*From Report of Committee No. 1. L. R. Clausen, Chairman, presented to the Railway Signal Association, at Niagara Falls, Oct. 10-12.

Points should open 1/16 in. and armature 1/16 in. from poles open.
1/32 in. from poles closed.
Armature pins, bone, 1/32 in. long.
Armature stop not adjustable.
Cut sections represent good practice if the relay breaks the circuit and shunts rails of adjacent track circuit.
Relays should be sealed and maintainer not allowed to adjust.

Relay Shelter.

Wood or metal boxes on wood or iron posts are satisfactory.
Where convenient to do so, relay boxes may be supported on signal masts or signal bridges.
If wood boxes are used, one thickness of matched pine with double hinged door, arranged for padlock is acceptable.
If iron boxes are used, single hinged door, ¼ in. thick, and arranged with dust gasket and for fastening the padlock, is satisfactory.
Iron boxes should be lined with wood, and wood board used for relays.
Iron boxes need not be connected to the ground.
All relays should be arranged in relay boxes so that all binding posts are accessible without moving the relay.
Relays may be placed in mechanism cases, if mounted on wood or other insulation.

Batteries.

Two gravity cells in parallel are satisfactory for average conditions, but special conditions may require more cells to be used on a track section.
Four-pound round mercury alloy zincs represent the best practice.
An ordinary flat leaf copper is acceptable, but it is advisable to use a shape of copper that will allow bending of same to prevent pulling upward through the copper sulphate.
Glass jar 6 in. x 8 in. for track cells represents the standard practice.
Track batteries should receive attention every two weeks.
Zincs should have life of one month in track battery service.
Storage cells in glass jars may be used, placed above ground, either in box or enlargement of signal post.
One storage cell on track circuit with one ohm in each leg of the circuit between cell and rail is recommended.

Bonding and Insulation.

The following specifications represent standard practice:
Two No. 8 Washburn & Moen gage E. B. B. galvanized iron wires for bonding purposes, placed outside of splices and inside of rail.
Two No. 6 B. & S. soft copper wire in tunnels, located outside of splices and inside of rails.
Two No. 6 B. & S. soft copper wire inside of splices and outside of rails used through platforms, crossings, etc.
Wire should be 16 in. to 18 in. longer than splice, with expansion loops provided on one end.
Wire should be inside of all spikes and should not be stapled to tie; bends should be made by hand.
Wires not to be twisted together.
Life of wires should be five to eight years under average conditions.
Frogs should be bonded in circuit in series with two wires not twisted which may be stapled to ties if required.
Ten inches to 15 inches slack should be allowed.
Hand switches should be included in circuit and insulated rods used.
Switch points should be bonded into circuit in shunt, two wires being used.
Sidings should be bonded to fouling point in shunt, two No. 8 B. & S. or No. 9 B. & S. copper wires being used for the shunt connection.
Sidings and main line cross-overs should be bonded into circuits whether operated by pipe line from one end or not.
Block signs are not used on sidings.
Switch instrument should be used on all siding derails and at both ends of all cross-overs.
Both ends of main line cross-overs should shunt both main track circuits.
All switch instruments should be arranged to shunt track circuits, two wires being used for connection to each rail and four contacts of the switch instrument if possible.
Interlocking switches and derails should be included in circuit, if expense and complications introduced are not too great, insulated rods being used for the purpose.
The channel pin type of bond plug should be used.
Copper plating of bond plugs is satisfactory, but tin plating may prove better.

Track Insulation.

Type of joints to be used on main line and in yards of terminals to have mechanical and insulating qualities equal to the best standard makes now on the market.
The 24-in. and 26-in. joint with four bolts is found to be long enough for satisfactory service.
One common fiber end post is sufficient with some types, others require two.
On light traffic sidings six bolt wood joints are satisfactory.
Joints need not be oiled and will give two to three years life under average conditions.
Fiber plates have life of one year under average conditions.
End posts six to nine months.
Electric crossings should be cut out of circuit, one joint in series being used for this purpose.
The effect of the high potential circuit on electric line rails may be reduced or nullified by one of the following methods, or combinations of the same:

A. Bonding the rails of the electric line together.
B. Introducing more insulated joints in the steam line.
C. The locating of track battery at crossing.
D. Using 16 ohm relay at crossing and breaking block wire through same.
E. Grounding sections of track of electric line.
F. Grounding sections of track of steam line.
G. Shunting street railway rails.
H. Introducing extra battery on track.
I. Removing ballast from rails of steam line.
J. Inspecting bond wires on steam line and keeping same in good condition.
K. Providing better path for high potential current on electric line.

No special devices are used to insulate track circuits through platforms or crossings.
For insulating rails from steel bridges, wood blocks or fiber insulated bolts, with wood or fiber shims below the rails are used.
Nearly all lines report trouble with foreign current, and the various methods for taking care of the trouble are enumerated immediately above in connection with electric crossings.

Battery Shelter.

Both chutes and wells may be used for housing track battery.
Chutes should be cylindrical, of cast-iron.
Nine in. by 7 ft. for two cells and 9 in. by 8 ft. for three cells is satisfactory under ordinary conditions with a maximum depth of frost of five feet.
Where four and six cells are used, two chutes placed side by side should be used.
Walls of chutes should be ⅜ in. to ½ in. thick.
Chutes should be placed with top 9 in. above ground, and frost covers used.
It is not practicable to use air tight chutes with a view of reducing the evaporation.
The connections in chutes should be fastened in connectors to keep them from grounding on chutes.
Wood elevators provided with rope for raising are satisfactory.
Lamps in chutes, manure, mineral wool, or similar material placed in and around chutes are recommended for protection against extremely cold intervals.
It is recommended, however, that the chutes be placed below the frost line.

Insulated Wire Connections.

No. 8 B. & S. or No. 9 B. & S. rubber covered copper wire should be used for track circuit; same size being used for all purposes, except battery chutes.
Two wires in parallel should be used around switches or crossings and other siding connections for each side of circuit.
Thickness of wall of rubber insulation recommended as 3/32-in. for No. 8 B. & S.; 5/64-in. for Nos. 9, 10, 12 and 14 B. & S.
One layer of braid should be provided.
No. 12 B. & S. standard wire should be used in chutes of approximately 18 strands.
Smaller wire for relay connection need not be used.
Wires may be placed either above or below surface of ground. Both are considered good practice.

Track Connections.

Twelve-inch slack is allowed for track connections.
Soldered joints at track connections should be poured.
Iron wire should be used for track connection to the rail and connections should be made three feet from rail joint.

Trunking.

Forty per cent. extra space should be provided in trunking containing track wires.
Stakes for supporting trunking should be 7 ft. apart and trunking 2 to 3 in. clear, if placed above the ground.
Bevel joints should be used, placed directly over supports and carried on a supporting piece.
Three x 3 inches is a good size trunking for track wiring.
Trunking should not be painted inside.
Trunking should be painted outside.
Trunking should not be nailed in slots, but through sides.
When crossing track, trunking should be placed 1 in. below rail,

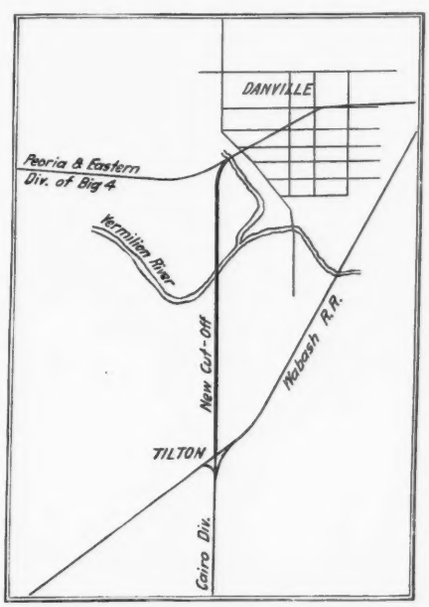
or 16 in. below rail, depending upon whether it is run above or below the ground.

White or yellow pine and redwood are satisfactory for this purpose.

With a few changes the association adopted this report, except the part concerning relays, which was referred back because the difference between .04 ampere and .06 ampere was deemed too small a difference for practical service. On the second specification under the head of bonding in tunnels, there was some discussion as to the use of copper, which is very liable to accidental breakage. One member uses in tunnels two copper wires and one galvanized iron wire; and he moved that this be the recommended practice, but as another member had found that galvanized iron would rust out in two or three weeks the motion was lost. It was voted that all bond wires should be fastened to the web of the rail. It was voted that the bonding from the main line to sidings should be of No. 6 wire instead of No. 9. A similar proposition for the use of larger wire was made at other points but was not approved by the meeting. The last specification under track connections, was made to read "not less than 3 ft."; and the second paragraph, under trunking, was made to read "not over 7 ft. . . . not less than 3 in." After these and a few verbal changes the report was adopted and the committee directed to prepare specifications.

Rebuilding the Cairo Division of the Big Four.

The Cairo division of the Cleveland, Cincinnati, Chicago & St. Louis extends from Cairo to Tilton, Ill., 258 miles. At Tilton it joins the Wabash and uses its tracks into Danville, about two miles farther north. Originally it was composed of several small roads, including the Cairo & Vincennes, the Danville & Southwestern and the St. Francisville & Lawrenceville, built 35 to 40 years ago. They were consolidated and taken over by the old Wabash, St. Louis & Pacific and operated as its Cairo division for a time. In 1885 it was surrendered by the Wabash, pending foreclosure, and for four years was operated by order of the court as the Cairo, Vincennes & Chicago. It was reorganized in 1889, and shortly after its reorganization, control of it was acquired by the Big Four, which has operated it ever since as its Cairo division. In addition to the main line there is a branch from St. Francisville to Vincennes, eight miles. A map of the line is shown herewith.



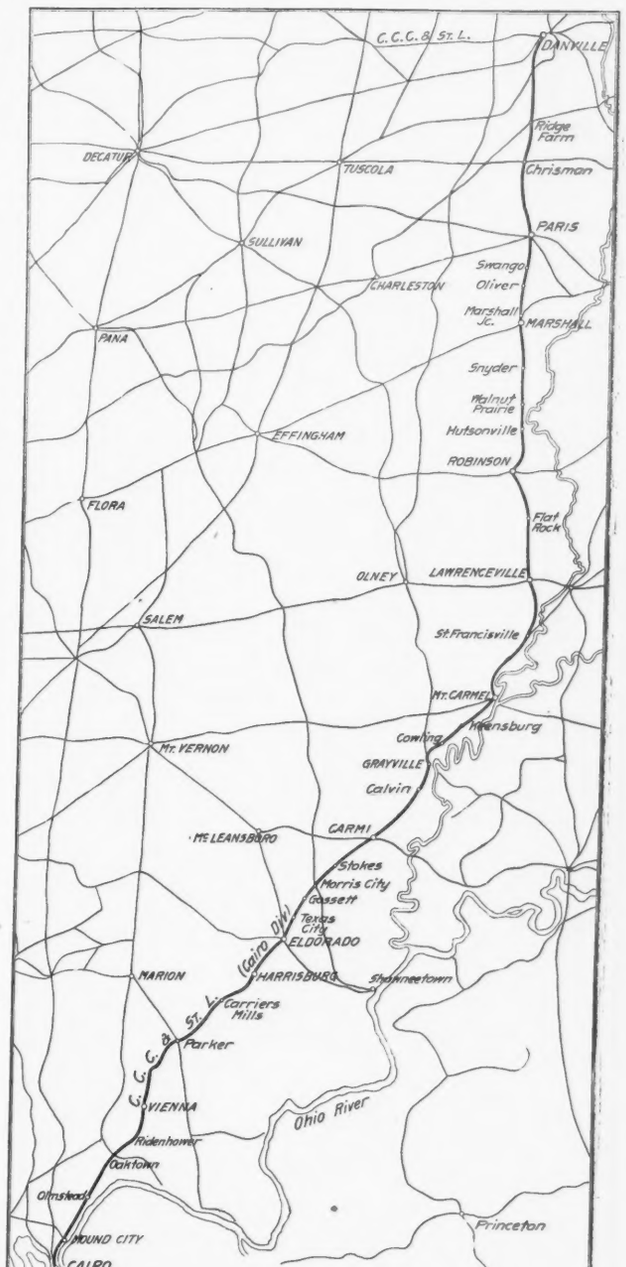
Cairo Division Connections at Danville, Ill.

Up to the present time this division has been one of the weaker members of the Big Four system. It was a light single-track line with numerous heavy grades and curves, and full of sags. It was largely dirt ballasted, no rails were heavier than 60 lbs., and the bridges, which were mostly trestles, were all wood. The line did not contribute a paying traffic and no money was spent to improve it.

However, with the development of the immense coal fields surrounding Harrisburg this line acquired a new value, which was greatly augmented by the purchase by the Vanderbilt interests of an immense tract in this new coal bearing region. To take advantage of the traffic possibilities, a low-grade direct line to Chicago was needed. This will be obtained in conjunction with the Indiana Harbor, also a Vanderbilt property, which was formerly a Chicago belt road but which is now being extended to Danville, and will parallel the Chicago & Eastern Illinois from that point to Chicago.

The Cairo division of the Big Four north of Harrisburg is being entirely rebuilt in order to convert it into a line adequate to the needs of the enormous traffic which will be available. Grades are being reduced from 1.5 per cent., the former maximum, to 0.3 per cent. northbound and 0.5 southbound; curves are being reduced or eliminated, the maximum on the new line being 2 deg., and the majority 1 deg and under; all new bridges are of permanent construction, concrete masonry being used throughout, the majority of the structures being entirely of plain or reinforced concrete. The entire line will be relaid with heavy rails, and ballasted.

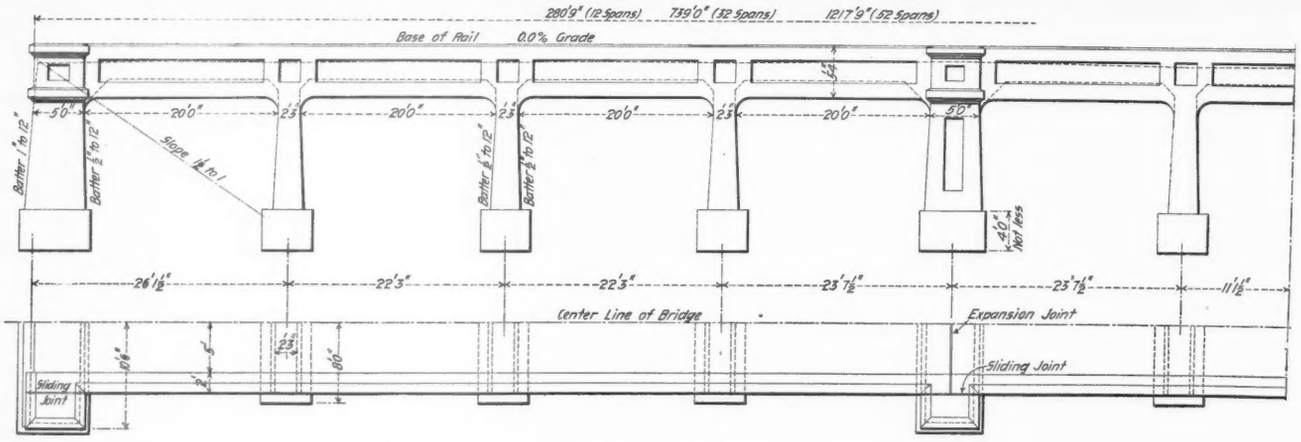
The work, which is being done with the minimum possible disturbance to traffic, may be said to consist of three classes. The first of these, involving no change of grade or location, the railroad company is doing itself. It consists of standardizing the banks and cuts, putting in new track, and ballasting. The second class involves offset locations in order to make grade and curvature revisions without interfering seriously with traffic. The amount of the offest depends, of course, on local conditions such as the amount of grade and curvature change, etc., but will average



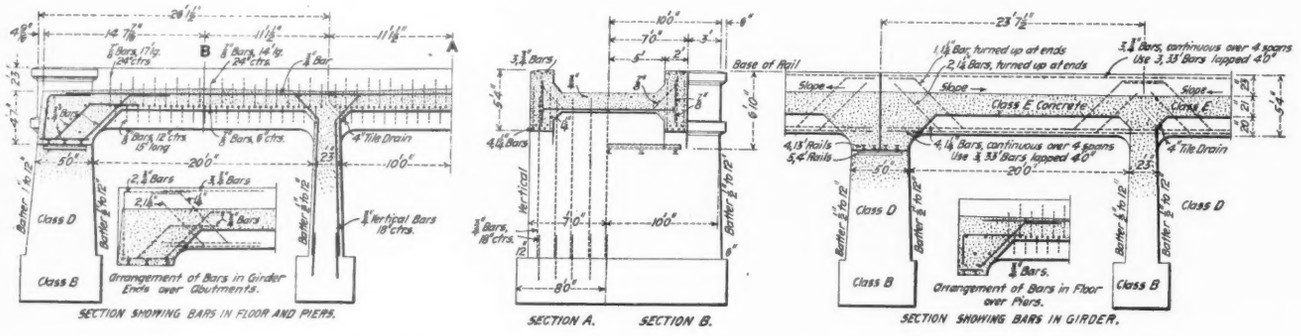
Map of the Cairo Division of the Big Four.

about 25 ft. This offset location work wherever it occurs has necessitated widening the right-of-way, by the purchase of additional land. The third class requires entire relocation of the line. This is being done at a number of points. The net result of this on the total length of the line will be to shorten it about three-quarters of a mile. The distance from Danville to Harrisburg is 199 miles.

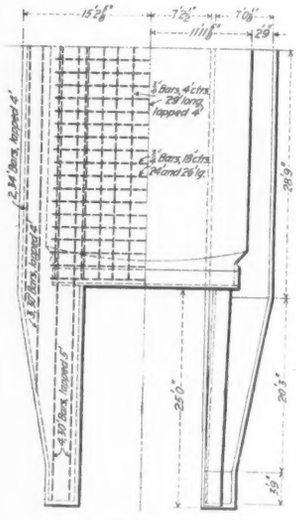
Taking Danville as the initial point in considering the improvements, one of the most important pieces of work is being done here. The Danville situation is outlined in one of the illustrations, which shows a small section of the town near its center, and the railroad connections most closely affecting the Cairo division. As al-

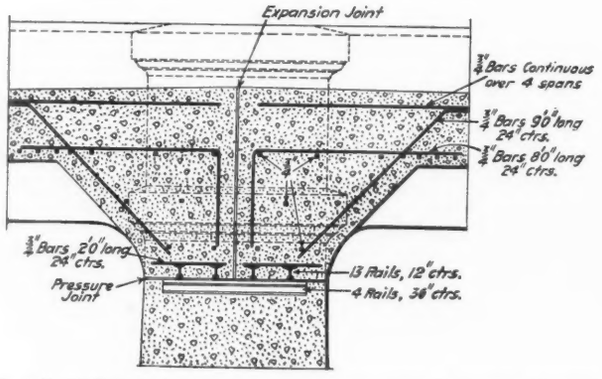


Reinforced Concrete Girder Viaduct over Lawrenceville Bottoms.

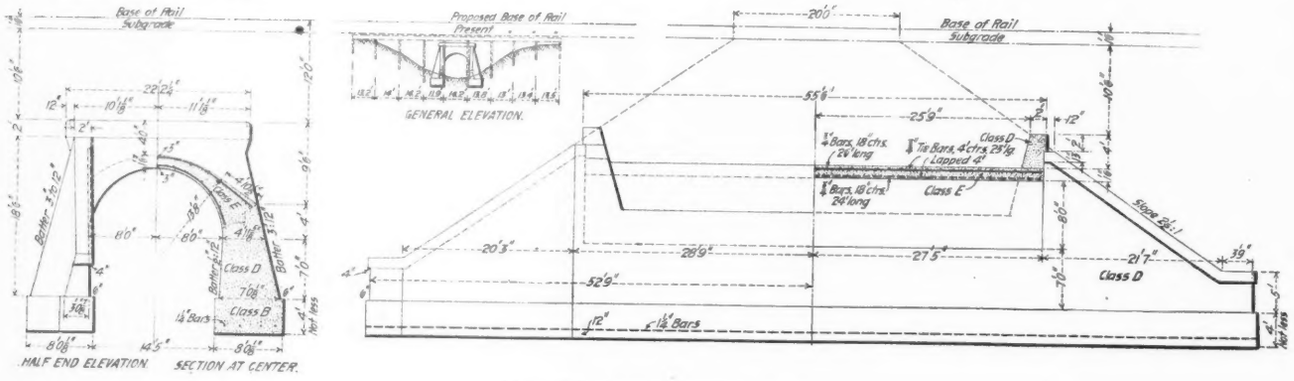


Details of Reinforced Concrete Girder Viaduct over Lawrenceville Bottoms.





Detail of Expansion Joint in Lawrenceville Bottoms Viaduct.



16-ft. Reinforced Concrete Arch.

ready mentioned, this line now ends at Tilton, using the Wabash into Danville. From Tilton a cut-off about 2½ miles long is being built due north into Danville to connect with the Peoria & Eastern division of the Big Four. The new Indiana Harbor line will join this same division a little farther east. The building of this cut-off involves the construction of what will be a notable reinforced concrete arch bridge across the Salt Fork of the Vermilion river. It will be a three-arch structure, containing one 100-ft. and two 80-ft. arches, and will be 90 ft. high above the bed of the river. The new line will go under the Wabash and also under a trolley line and a street. This involves some heavy cutting, the material from which is being hauled across the river and dumped from a trestle 85 ft. high to form the approach to the Vermilion river bridge. This piece of work will involve 500,000 yds. of earthwork and 12,000 yds. of masonry.

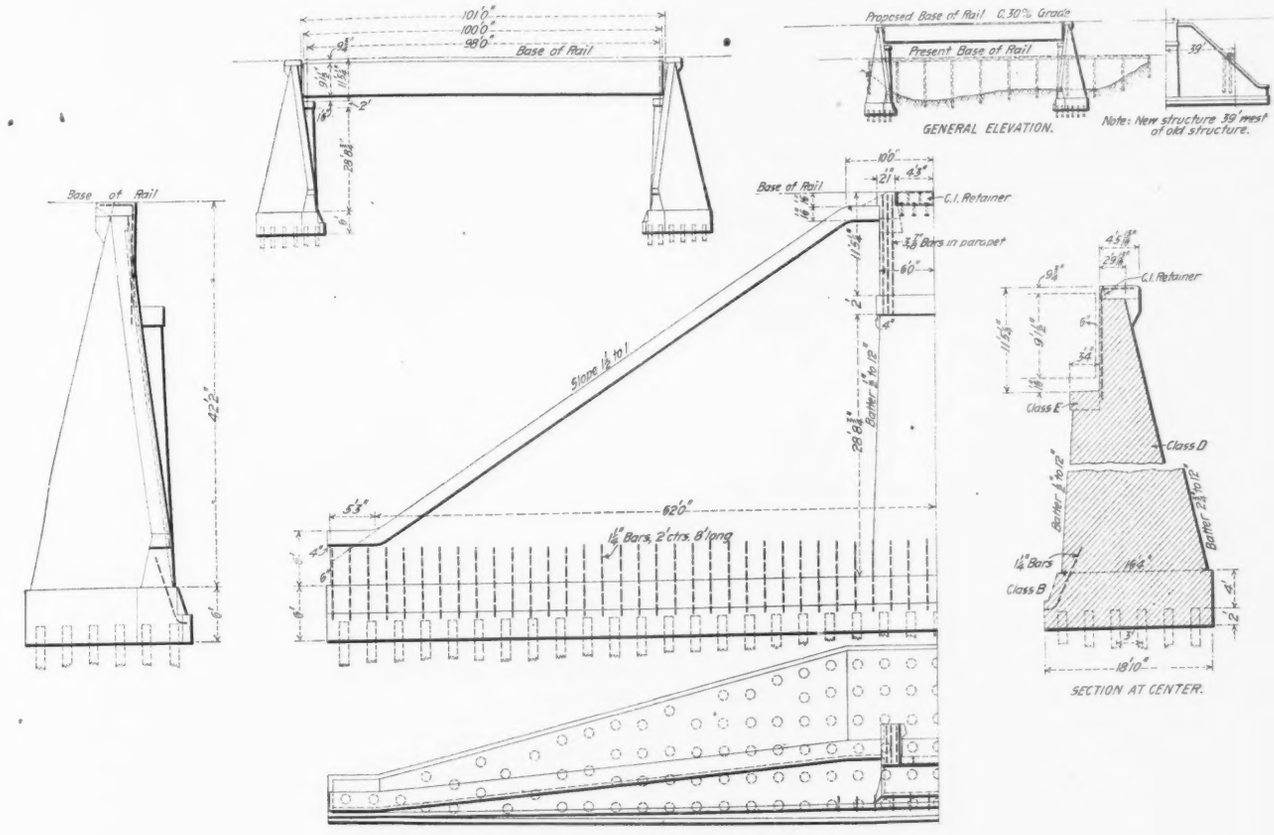
The next large piece of work will be just north of Paris, where about three miles of offset location occurs to revise the grade, which is now 1 per cent. maximum on this section. Beginning a short distance south of Paris and extending to Oliver there will be about six miles of relocation. A part of this is to avoid Swango Hill, where there is a northbound grade of over 1 per cent. about 1½ miles long. A uniform grade of 0.3 per cent. will be established on the new line. There will be about 250,000 yds. of earthwork and 1,600 yds. of masonry.

Another relocation stretch of about equal length, involving 200,000 yds. of earthwork, begins about 2½ miles north of Marshall Junction and extends 3½ miles south. The new line will include a steel viaduct over Big Creek about 400 ft. long and 80 ft. high, the plans for which have not yet been made. From Snyder to Walnut Prairie about 3½ miles of offset location, involving 175,000 yds. of earthwork and 2,600 yds. of masonry, is being done to reduce the present 1 per cent. northbound grade. A similar stretch is being done at West York. Between Robinson and Flat Rock there will be about 6½ miles of relocation, and on each side of Lawrenceville there will be relocation stretches amounting in all to about four miles. This work takes the line through the Lawrenceville bottoms where much trouble from washouts has been experienced in the past. To avoid difficulties on the new line from this source, about 2,200 ft. of reinforced concrete trestle will be built, there being three structures approximately 1,200 ft., 700 ft. and 300 ft. long respectively. The materials to be handled will approximate 300,000 yds. of earthwork and 10,000 yds. of masonry. The work will include a crossing of Embarras river.

At St. Francisville there will be about three miles of relocation, involving 140,000 yds. of excavation, to reduce excessive curvature and the present grade of 1 per cent. each way. The Vincennes branch, which starts here, will have to be extended a short distance west and a new Y put in for connection to the new line.

Beginning about a mile north of Mt. Carmel and extending beyond Keensburg, there will be about 10 miles of offset location for grade reduction. South of Cowling about one mile of relocation will be done. Starting at Grayville there will be a stretch of about three miles of offset location, another stretch of six miles from Calvin south, and a similar stretch from Carmi to Stokes, all for grade reduction. The last-named stretch will join the Stokes-Texas City relocation, which is about 12 miles long and the longest relocation stretch on the line. This makes about 18 miles of continuous new work on this section. The primary purpose of the relocation work here is to avoid Gosset Hill, about five miles north of Texas City. The present line climbs over this hill on a 1¼ per cent. grade about two miles long northbound, and has four heavy curves, two being 4 deg. and two 3 deg. The new line will run around this hill, passing about a mile to the east of the present line.

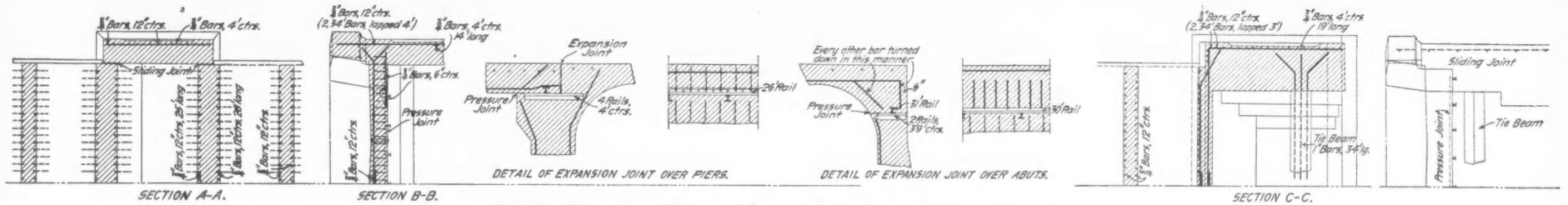
The plans outlined in the preceding paragraph involve some heavy work, the Mt. Carmel-Keensburg piece having about 275,000 yds. of earthwork and 1,700 yds. of masonry; the Grayville offset about 270,000 yds. of earth and 3,000 yds. of masonry; the Carmi-Stokes offset about 195,000 yds. of earth and 3,500 yds. of masonry; and the Stokes-Texas City relocation about 540,000 yds. of earth and 6,000 yds. of masonry. In addition to what has been enumerated for the entire line there will be numerous short stretches of offset location work for grade revision and flattening of curves. The total estimated amount of materials involved in the entire work is 4,000,000 yds. of earthwork and 75,000 yds. of masonry.



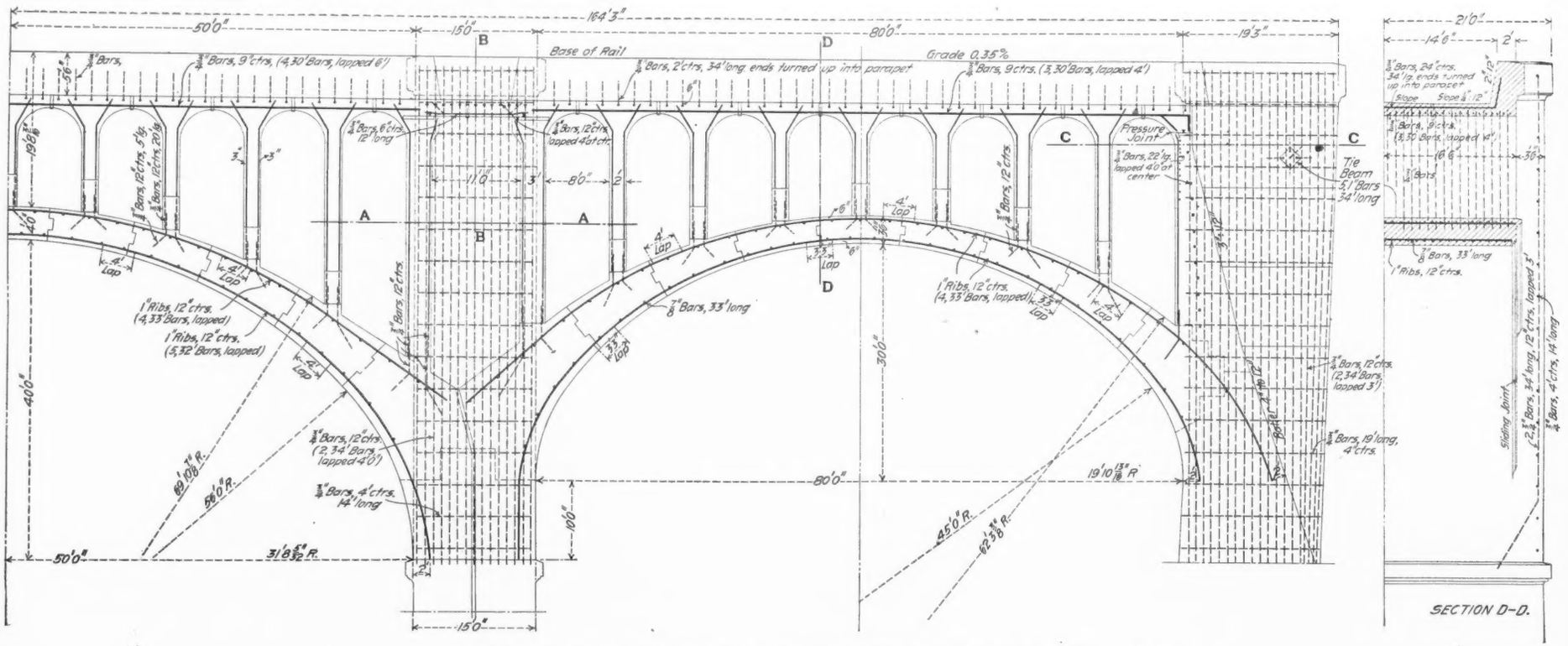
Bridge No. 146 and Details of the Concrete Abutments.

The line will be gravel ballasted, the company having a large gravel pit at West York. It will be laid with 80-lb. and 90-lb. rails. The former will include about 75 miles of 80-lb. rails taken from the St. Louis division of the road. The remainder of the work will be laid with new 90-lb. rails.

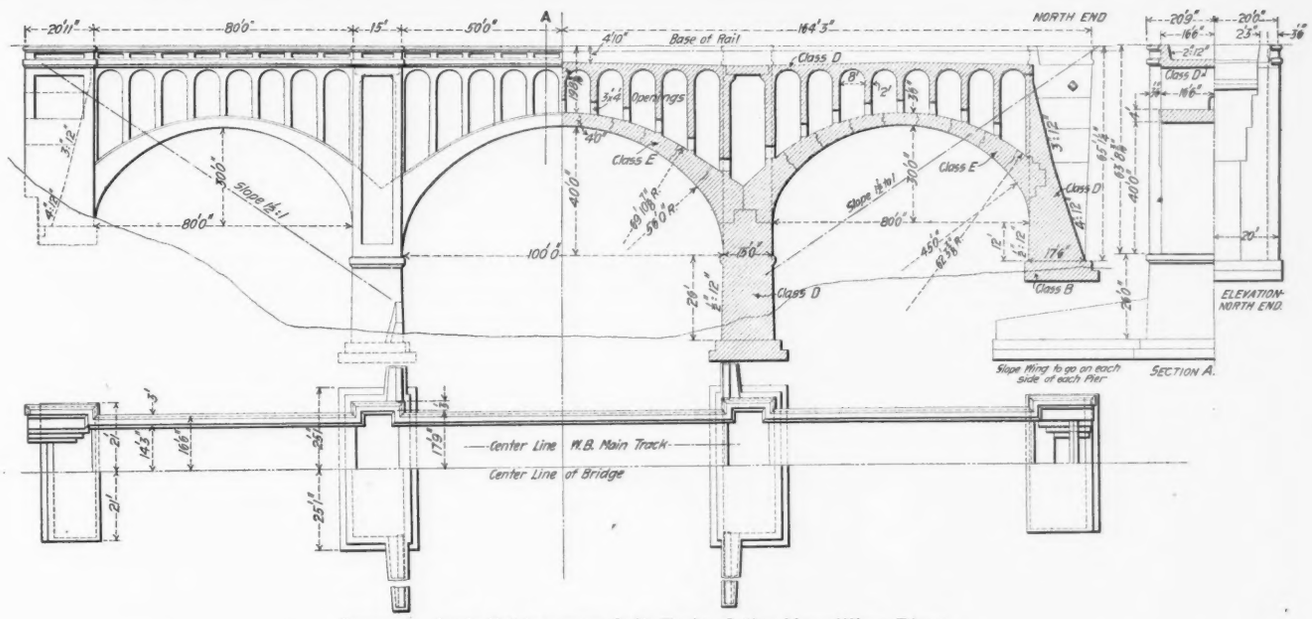
Perhaps the most interesting features of the work will be the concrete bridges, typical examples of which are illustrated herewith. Two of these designs—the Vermilion river bridge and the Lawrenceville Bottoms trestle—have already been mentioned. The first is a symmetrical three-arch double-track structure, the 80-ft. arches flanking the 100-ft. central arch. A three-centered arch is used, the smaller ones being 30 ft. high above the springing line, and the larger one 40 ft. The thicknesses at arch crowns are 3 ft. 6 in. and 4 ft. respectively. The spandrel arches are 8 ft. The bridge is designed as a plain concrete structure, the Johnson corru-



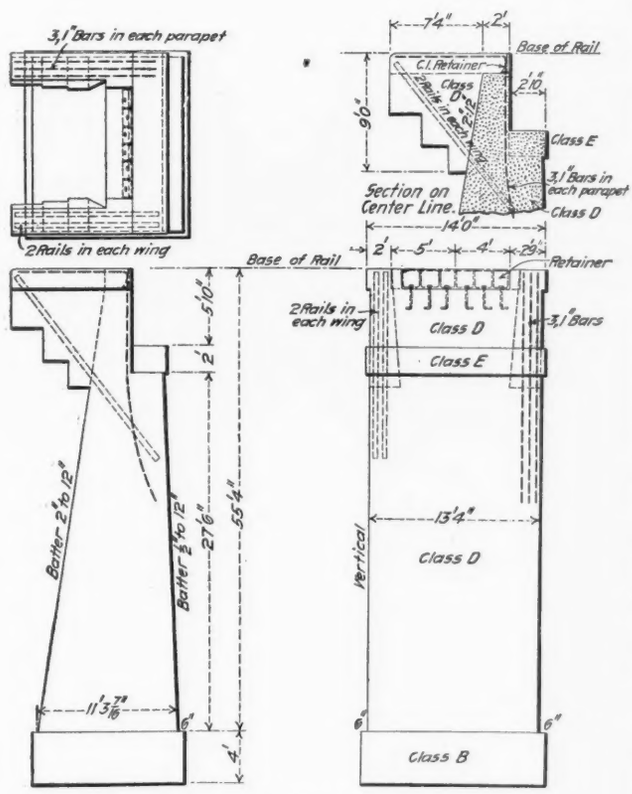
Details of Steel Reinforcement in Vermillion River Concrete Arch Bridge.



Details of Steel Reinforcement in Vermillion River Concrete Arch Bridge.



Concrete Arch Bridge over Salt Fork of the Vermillion River.

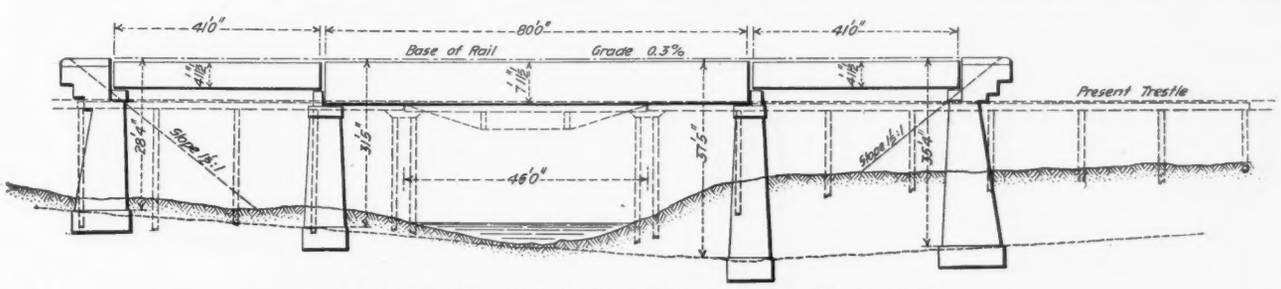


Details of Abutments for Bridge No. 153.

gated steel bars used being a precautionary measure only. Three mixtures or classes of concrete are used in the bridge, being designated on the drawings as classes B, D and E respectively. The first of these is a 1 cement-9½ gravel mixture, equivalent to a 1-4-8 stone mixture. Class D is a 1-6½ gravel mixture, equivalent to 1-3-6 stone, and class E is a 1-2-4 stone mixture. The first is used for foundations, the second for abutments, wing walls, bench walls, etc., and the third for arch rings, box culvert covers, girders, etc. The foundations for this bridge are carried down to shale. For the piers, the foundations are spread at the bottom to 25 ft. 2 in. for the north abutment to 22 ft. 6 in. and for the south abutment to 18 ft., due to the difference in elevation of the abutment footings.

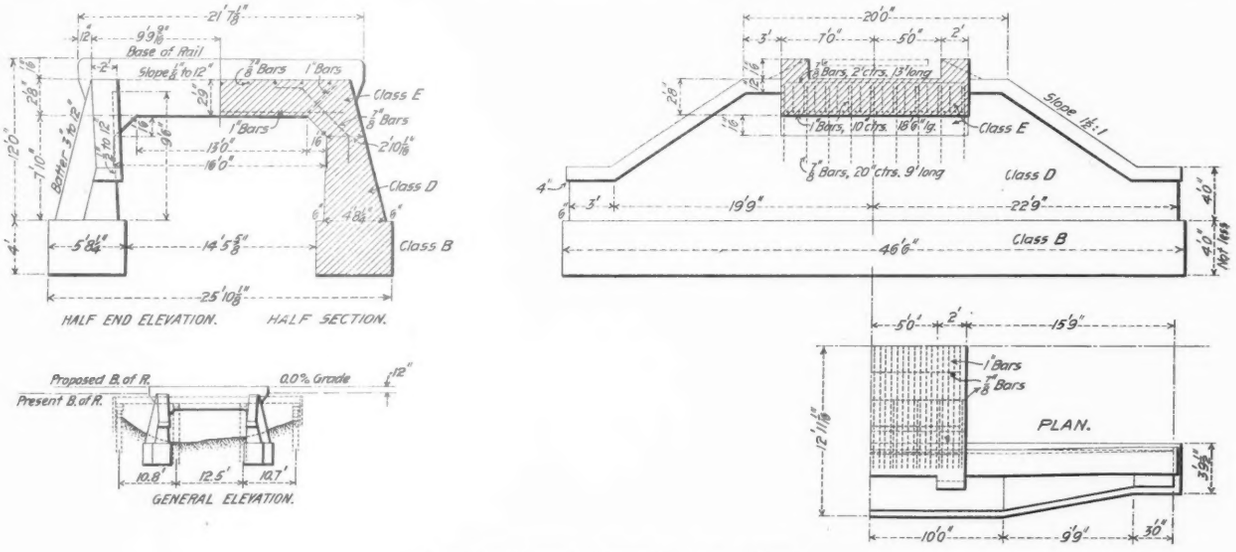
The piers up to the arch haunches are class D concrete, as are the abutments, spandrel arches and entire upper structure. The half longitudinal section shows the manner of putting the voussoirs into the arch rings, the numbering on the different sections indicating the sequence. Details of novel expansion joints over the piers and abutments are shown. For the abutments the pressure surfaces have lengths of 60-lb. rail imbedded in them, the upper surface having one 31-ft. length placed transversely, ball down, and the lower surface 2-ft. lengths placed longitudinally, 3 ft. 9 in. on centers. In each case the balls extend ⅛-in. from the surface of the concrete, which has a smooth flat finish to enable contact to be made at the rails only. Two layers of felt are placed between the surfaces. The arrangement for the piers is similar except in the lengths and spacing of the rails. The cross walls of the spandrel arches have each a 4-ft. x 3-ft. 4-in. arched opening to form a passageway between arches. The position of the embankment slope at each end of the bridge is indicated, from which it will be seen that the end arches will be from one-half to two-thirds filled up. These flanking arches are primarily to take the slopes of these embankments and are not necessary as a waterway. The bridge will contain approximately 11,000 yds. of concrete.

The most novel structures on the line are the Lawrenceville Bottoms trestles, all three being similar in design and differing only in length. Each is, in effect, a series of 20-ft. boxes joined into a continuous structure. The longest will have 52 spans, the next 32 spans, and the shortest 12 spans, their lengths over all being 1,217 ft. 9 in., 739 ft. and 280 ft. 9 in. respectively. The height from top of foundation to base of rail varies from 10 ft. to 14 ft. 6 in. due to irregularities of the ground surface. Other pier and footing dimensions vary to correspond. For the box tops, instead of slabs



Bridge No. 153 with Concrete Piers and Plate Girder Spans.

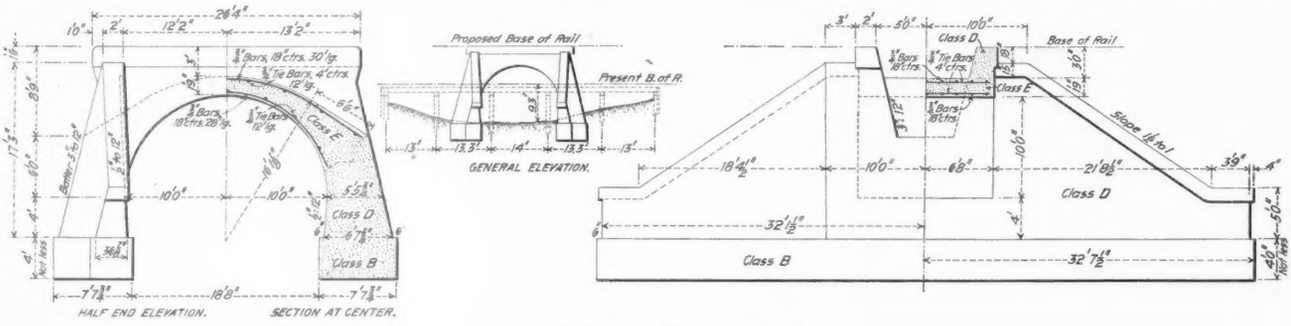
a reinforced concrete through girder design is employed. There are two girders 5 ft. 4 in. deep and 2 ft. wide, with a 1-ft. 9-in. floor between, integral with the girders. The top of the floor is 1 ft. 11 in. below the girder top and its bottom is 1 ft. 8 in. above the girder bottom, a heavy fillet being provided at the corners where floor and girders join. The width outside of girders is 14 ft. The girders, of course, form the coping for the structure, and it is claimed that the design is economical of material. Johnson corrugated steel bars varying from ¾ in. to 1¼ in. are used for reinforcing, their disposition being shown in the various sections and details. Expansion joints are provided over the abutments and at every fourth pier, similar in design to those used in the Vermilion river bridge, except that there are three transverse rails over the abutments



16-ft. Reinforced Concrete Box Culvert.

and four over the piers, and the longitudinal pieces are spaced 3 ft. on centers. The three classes of concrete are used in these structures in the manner already stated: Class B for the foundations, class D for abutments and piers, and class E for the girders and floor.

All of the smaller structures are box culverts or arches, typical designs of which are shown. Also, two designs of abutments for steel girder bridges are included. In one of these the projecting parapet wall, first used on the Chicago, Indianapolis & St. Louis Short Line work of the St. Louis division of the Big Four (*Railroad Gazette*, March 11, 1904), is employed. Each wing is reinforced by two lengths of rail, and by three 1-in. corrugated bars along the upper surface of the parapet and extending down into the abutment is shown. Both designs have a cast-iron retainer or curb



20-ft. Reinforced Concrete Arch.

placed transversely between parapets at the outer edge of the masonry to permit the standard depth of ballast to be used over the front wall of the abutment.

The contract work has been let by sections as follows: Danville-Tilton, grade work to the McArthur Brothers Company, Chicago; masonry to the Bates & Rogers Construction Company, Chicago. Tilton-Allandale, grade work to W. J. Oliver, Knoxville, Tenn.; masonry to the Collier Bridge Company, Indianapolis, Ind., except the Lawrenceville Bottoms work, which was let to Wells Bros. & Brown, St. Louis, for earth, and Moore & Mansfield, Indianapolis, for masonry. Allandale-Harrisburg, grade work to Walsh & Johnson, Davenport, Iowa; masonry to the Widell-Finley Company, Chicago. Mr. F. W. Smith, Division Engineer of the Construction Department, is in immediate charge of the work, under the direction of Mr. W. M. Duane, Superintendent of Construction. Acknowledgments are due Mr. G. W. Kittredge, Chief Engineer of the Big Four, for the data for this article.

Transportation of Explosives.

A special committee, appointed by the President of the American Railway Association last April, has made an exhaustive study of the subject, and, in a report presented to the association at its Chicago meeting, October 25, says that a general code of regulations for the transportation of explosives ought to be adopted by all of the railroads of the country. A set of regulations has been compiled; and while the committee, for reasons given, does not recommend final action, it is desirable that all railroads adopt the new rules, as far as practicable, without delay. Before final action is taken it may be found desirable to ask Congress for a Federal law regulating the transportation of explosives.

The committee making the report consists of Messrs. James McCrea, Pennsylvania Lines; A. W. Sullivan, Missouri Pacific; A. H. Smith, New York Central; N. H. Maher, Norfolk & Western, and Dr. Charles B. Dudley, Pennsylvania Railroad. The regulations presented are in their main features similar to those recently adopted by the Pennsylvania Railroad and noticed in the *Railroad Gazette* of July 14 last, page 43. The report is supplemented by a report from Dr. Dudley embodying a highly interesting study made by him of all the conditions surrounding the transportation of explosives; also a report made by Dr. Charles E. Munroe, of George Washington University; President Henry S. Drinker, of Lehigh University, and Dr. Charles F. McKenna, of New York City, who were called in as expert advisers; two pages of the views of manufacturers; a list of 165 establishments which make explosives, of which 57 are in the State of Pennsylvania; an abstract of the laws of the United States and of all the states and a large number of cities, and a compilation of replies from railroad companies showing the regulations in force on their respective lines. This last includes a copy of the regulations which were in force on the Pennsylvania Railroad previous to the adoption of the new code this year, and also contains suggestions from

some of the roads concerning possible further improvements. Many railroads reply that they have in force regulations similar to those of the Pennsylvania (which are dated Sept. 25, 1899).

A cursory examination of the regulations presented by the committee shows but few points of difference between these and the new regulations of the Pennsylvania. Only box cars of at least 30 tons capacity must be used. Steel underframe box cars are "recommended." The rules apply to explosives in any quantity; those of the Pennsylvania deal chiefly with lots of 5,000 lbs. and over. A car containing explosives must, when practicable, be not closer than 15 cars from the engine or 10 cars from the caboose, unless the length of the train will not permit. Explosives must not be placed in a train within five cars of each other, and not more than three such cars placed in any one train.

Dr. Dudley's report gives a mass of interesting information concerning the manufacture of all kinds of explosives and the behavior of different explosive substances when used or when stored. He tells of a railroad accident in which a wooden keg containing 25 lbs. of black powder was blown a distance of 3,000 ft. and recovered intact. The use of refrigerated cars for carrying nitro-glycerine powders is held to be inadvisable because the subsequent artificial thawing out of these powders would probably increase the danger, as a whole. Dr. Dudley finds that 216 million pounds of explosives were made in 1900, and estimates that the business has largely increased since that time, making the traffic in the United States at present perhaps 50 carloads a day.

It would appear that the regulations recently adopted by the Pennsylvania Railroad, as well as those now reported, are necessarily unsatisfactory in some respects because of the impossibility of getting all shippers to agree to the restrictions which the railroads would like to impose, and the suggestions made to the committee by the Pennsylvania Railroad for further improvement in the conditions are therefore of interest. These suggestions are:

1. Manufacture should be supervised by Federal authority and packing and marking should be in conformance with standard practice recommended by the American Railway Association. Inspection should be made by common carriers through a recognized inspector.

2. Boxes containing high explosives in quantities from 50 to 100 pounds should be made of ¾-in. lumber. Boxes containing less than 50 pounds should be made of ½-in. lumber; each package to be stenciled "High Explosive—Dangerous" on sides, ends and top.

3. Rates for transportation in car-loads should be sufficiently increased to warrant such transportation. Rates on less than carloads should be made prohibitively high so as to force car-load shipments to distributing centers and the construction of magazines for distributing purposes.

4. Legislation, Federal or State, should be secured making it a misdemeanor to ship explosives under other names.

5. An individual road can hardly go farther than Pennsylvania R. R. Circular No. 174A (the new rules) without placing an undue burden on manufacturers located on its lines, compelling them to suffer loss by competition.

Convention of the Superintendents of Bridges and Buildings.

The fifteenth annual convention of the Association of Railway Superintendents of Bridges and Buildings was held in the Monongahela House, Pittsburg, Pa., October 17, 18 and 19. Contrary to expectation, the attendance was somewhat smaller than usual, there being only about 20 per cent. of the members present. President C. A. Lichty (C. & N. W.) was in the chair. The address of welcome was delivered by Mr. W. B. Rodgers, City Solicitor, Mr. J. H. Cummin (Long Island R. R.) responding on behalf of the association. The Secretary reported the addition of 20 members since the last meeting, the total membership now being 314. A balance of $917 was reported in the treasury.

The officers for the ensuing year are: President, J. B. Sheldon (N. Y., N. H. & H.); First Vice-President, J. H. Markley (T., P. & W.); Second Vice-President, R. H. Reid (L. S. & M. S.); Third Vice-President, R. C. Sattley (C. & N.-W.); Fourth Vice-President, J. P. Canty (B. & M.); Secretary, S. F. Patterson (B. & M.) re-elected; Treasurer, C. P. Austin (B. & M.), re-elected; Members Executive Committee, J. S. Lemond, C. W. Richey, H. Rettinghouse, H. H. Eggleston, F. E. Schall, A. E. Killam. Messrs. Jas. McIntire, formerly of the Erie, now retired, and E. F. Wise, formerly of the Illinois Central, now retired, were elected to life membership in the association. Boston was selected as the next place of meeting.

The association established last year the policy of having standing committees, ten such committees having been appointed during the past year. There were in addition eight subjects assigned for special committee report at this meeting. Most of the standing committees were not yet prepared to make reports on their subjects, there being but two printed reports submitted. Two other brief reports in manuscript form were presented at the meeting, while other committees simply reported progress.

Five of the eight special committees submitted reports. The first of these was on "Construction and Maintenance of Docks and Wharves." A typewritten report read by the chairman of the committee, Mr. H. H. Rettinghouse, gave information regarding merchandise wharves and ore docks on the Great Lakes only, letters of inquiry to members on the seaboards having been unanswered. The report was devoted principally to the ore docks, giving the costs per lineal foot, per thousand feet B. M., and per ton of storage capacity of the Duluth, Missabe & Northern dock at Duluth, Minn., the Duluth & Iron Range dock at Two Harbors, Minn., and the Wisconsin Central dock at Ashland, Wis. These docks have respectively 384, 116 and 314 pockets and storage capacities of 80,640 tons, 33,600 tons, and 48,356 tons. The report gave all other important dimensions as well. Information relative to the life of such docks and the parts first needing repairs was included. The discussion was brief and related principally to the costs of materials, disclosing considerable variations between different parts of the country.

There was no report on subject No. 2, "Relative Value of Concrete and Timber Piles," and no discussion was offered by members when the subject was presented.

The report on subject No. 3, "Concrete Building Construction, Including Platforms," was presented in manuscript form by the chairman of the committee, Mr. C. W. Richey. As indicated by the title, the report consisted of descriptions of various kinds of concrete buildings, station platforms being included and forming the initial section of the report. All of the buildings included, which are notable examples of this type of construction, have already been described in engineering journals, and the report is therefore not reproduced here.

In the discussion Mr. W. F. Steffens (N. Y. C.) thought that for certain railroad buildings reinforced concrete might prove rather costly from the maintenance standpoint, a point that does not appear to have received the consideration it deserves, mention being made especially of engine houses. In the event of a locomotive punching a hole in the back wall of such a house, how would it be repaired effectively? The New York Central had a design of reinforced concrete roundhouse prepared, but abandoned the concrete for brick after consultation with practical men on the system, who thought its use would be a mistake.

Advocates of reinforced concrete pointed out that it would not be an easy matter for a locomotive to punch a hole in such a wall, and in comparison with brick the force that would make a hole in the reinforced concrete wall would probably knock down the entire brick wall. Mr. Richey suggested that the reinforced concrete wall could be strengthened against impacts from locomotives by having a buttress built into it at the proper place. Mr. Pickering (B. & M.) suggested that some means might be adopted for localizing the damage to a wall from such a blow and thus simplify the repairs. A brick wall could have the section with which the locomotive would come in contact enclosed in a frame, which would permit that portion only to be knocked out, and easily replaced. For a reinforced concrete wall the steel could be omitted from that portion of the wall.

Some members objected to concrete platforms because they are slippery. It was pointed out, however, that this is a defect of construction, such platforms having doubtless been given a neat cement finish, which was troweled. If the surface is properly treated it need not be slippery.

Mr. Cummin (Long Island) reported that his road is building concrete stations and platforms on its elevated lines. He also referred to the effect of fire on concrete construction, which will withstand considerable heat without apparent injury, but when water comes in contact with it under such circumstances it disintegrates. This point was worthy of consideration in connection with concrete buildings. In the event of a hot fire adjacent to such a building, what would be the result to the building should the firemen turn water on it?

On subject No. 4, "Anchors for Plows and Derricks," little discussion was offered. Mr. H. H. Eggleston (C. & A.) said that they unload their trains while in motion, the material being spread with a bulldozer.

The next subject was "Methods of Repairing Roofs." The chairman of the committee, J. N. Penwell (L. E. & W.), read some letters on the subject which had not been included in the report. These letters dwelt on the advisability of more frequent inspection and repairs of roofs, as the trouble and cost are much greater when injuries and leaks are neglected. Information was asked for regarding the use and durability of lead or copper flashing on roundhouse skylights. Mr. Tanner (M. P.) said they had used copper on a house at Omaha and it was eaten out in about four years. Paper, protected by pitch, was then substituted. Mr. Killam (Intercolonial) said they had had no trouble from the use of lead. Mr. Cummin (L. I.), who had asked the question about metals for flashing, said he had tried everything in practice, but none lasted. He cited the case of a copper-lined ventilator on which he had obtained a five-year guarantee from the builder, and which the latter was obliged to renew once in that time. Afterward felt with sheathing outside was substituted and was satisfactory. He further stated that they

were abolishing hanging gutters on their roundhouses as far as possible, and forming the gutters in the roofs instead.

Mr. Clark (B. & O.) said their practice was to roof all stations and shop buildings with slate. On roundhouses and temporary buildings patented roofings were used and were satisfactory. He thought the foundation for such roofings was an important factor in their durability. If there were cracks and knot holes to allow the gases to reach the under side of the material, it would deteriorate much more rapidly. Mr. Perry (P. & R.) thought the pitch of the roof also is a factor, flat-pitch roofs covered with patented material lasting longer than those of steeper pitch. A slag roof should not have a pitch to exceed 3 in.

Mr. Canty (B. & M.) said the rapid decomposition of the nails was a chief trouble with them. If they could find a nail that would last, their roofs would be longer lived. He mentioned a composition nail used in slate roofs that was lasting fairly well. Mr. Richey (Penn.) recently took down a slate-roofed roundhouse 20 years old in which the tinned iron nails were in a good state of preservation. Mr. Killam said the roundhouses of the Intercolonial of Canada have no regular gutters. The roofs are made of several layers of paper, suitably lapped, covered with a material composed of asbestos, asphalt and tar, the roofs costing about $6.50 a square foot. They expect their roofs to last 25 or 30 years, not considering them satisfactory otherwise. They use an iron nail, galvanized.

There was no report on the next subject, "Methods of Watering Stock in Transit."

The report on subject No. 7, "Protection of Water Tanks and Water Pipes from the Action of Frost," was made up of extracts from letters received in answer to a circular of inquiry sent out by the committee. These letters disclosed wide variations in practice, as was to be expected. Many of those taking part in the discussion had outlined their practice in their letters and offered little additional information. Mr. Staten (C. & O.) asked if any more trouble from freezing was experienced with iron than with wooden tanks. Mr. Canty (B. & M.) said they found no difference. They make a practice of keeping piping out of the tank. The float valve is in a pit under the tank, being operated from the float within the tank by suitable rods and levers. Mr. Killam said the mechanical department had charge of the water stations on the Intercolonial. But despite the fact that the temperature sometimes goes to 42 deg. below zero, they are not troubled from freezing up of their tanks. The frost boxes have several air spaces well lined with paper. The tanks are formed of 4-in. white pine staves, and have a double roof, the first being flat, and the outer one pitched, of matched lumber and covered with galvanized iron. Where they pump into the tank, the exhaust line is run up through the tank. Where the tank is fed by gravity, the space beneath is enclosed and a stove installed.

Mr. Penwell (L. E. & W.) finds their trouble to vary according to the source of supply. The most trouble is encountered where the water is taken from shallow streams. Where they take water from springs and pump with hydraulic rams, there is much less trouble and when a deep well furnishes the water there is no trouble at all. Also, the amount of water used per day at a station is a factor, there being much less difficulty where large quantities are taken.

There was no report on the last subject, "Recent Practice in Cofferdam Work." There was some discussion of the use of steel sheet piling under this head, however, Mr. Schall (L. V.) having asked regarding the experience of members with this piling. Not many had ever used it. Mr. Soles (P. & L. E.) told of having recently witnessed the efforts of some contractors to withdraw a steel sheet piling they had driven, and of the great difficulty they experienced. Mr. Steffens (N. Y. C.), chairman of the committee, said he understood that steel sheet piling was quite satisfactory for use in soft ground, but was not very successful in coarse gravel or rock.

The standing committee subjects were next taken up. There was no report on the first, "Pile and Frame Trestle Bridges." There was a brief discussion, during which the President asked members to forward drawings of their standard pile and trestle bridges to the committee for use next year. Mr. Clark (B. & O.) described their standards. They use a double cap and omit corbels, considering the latter bad practice.

There was a printed report on the second subject, "Steel Bridges." Mr. R. H. Reid (L. S. & M. S.) had contributed a written discussion, which was printed with the report. In some remarks in the convention he emphasized the points contained in the written discussion, and also told of a case where they had taken out a 60-ft. deck plate girder bridge with a steam derrick and replaced it by a heavier one in 18 minutes, the operation including uncoupling and taking off the rails, lifting the old bridge out and onto cars, bringing in the new one and lowering it into place on the masonry, coupling it up and putting it in shape for traffic. Referring to cleaning and protecting the steel from corrosion, he said that the brine from refrigerator cars dripping on the steel forms a hard scale, which has to be cut off with hammer and chisel. They know of no paint that offers a satisfactory protective covering. They tried putting sheet lead on the stringers, but it squeezed out; also, it does not protect the lower part of the stringer. Paper had been tried but failed, first by cutting through at the edges of the stringer and then all the way across under the ties.

The matter of the use of riveted and pin-connected spans came up. Mr. Staten (C. & O.) thought pin-connected truss bridges could be erected to better advantage and with much less delay to traffic than riveted spans. H. H. Eggleston (C. & A.) suggested that this objection could be overcome by building the riveted span at one side and afterward sliding it into place. Mr. Reid said it was entirely a question of erection and first cost between the two. About 180 ft. is the economical limit for riveted spans on the basis of comparative cost, riveted and pin-connected spans balancing in cost at about 200 ft. In pin-connected spans of the latter length, the members are heavy enough to hold them down and give a stable structure; while with riveted spans at this and greater lengths, serious difficulties are offered in the field by the detail parts in connecting up, etc.

Mr. Sheldon (N. Y., N. H. & H.) asked the length and size of field rivet that can be driven to fill its hole properly and do its full duty. Mr. Reid said they had driven ⅞-in. steel rivets with a 5-in. grip and 1-in. rivets with a 6-in. grip. He regarded this as the limit for hot driving. Cold driving may be done up to 2½ in. diameter and 10-in. grip, but powerful machinery is needed. The Lake Shore specifications require that the length of rivet should not exceed five times its diameter. In regard to hand and pneumatic hammer driving, he thought the latter was better than the most careful hand work; and air hammers can also be used in places inaccessible to hand driving. Other members thought the latter the chief advantage of air hammers, believing hand driving to be more efficient, and fully as cheap, if not cheaper.

There were no reports on the next five subjects, namely: Buildings; Docks and Wharves; Water Supply; Fire Protection; Fences, Crossings and Cattle Guards. Some discussion occurred on Fire Protection. Mr. Rettinghouse (Wis. Cent.) said all buildings should be kept scrupulously clean and should be constantly and carefully inspected; bridges likewise. Mr. Reid said the Lake Shore had tried protecting the stringers of its wooden bridges by covering them with tin; but gravel and cinders got under the tin and made holes; also it hides the stringer from sight and causes it to dry out much more slowly than if not so covered. Mr. Cummin has a trestle 4 miles long over Jamaica Bay, Long Island, on which trestle are three fishing stations. At each station he has a small house about 8 ft. square containing a hand car on which is mounted a double-acting force pump with 20 ft. of 2-in. suction and 25 ft. of 1-in. discharge hose. These equipments have already prevented the spread of several fires that promised to be disastrous. He said that men should be drilled in the use of fire apparatus wherever installed if it is to be effective.

Mr. Canty (B. & M.) mentioned some points regarding which special care should be experienced, such as the proper protection of the floors under stoves; tissue records should be kept in fireproof rooms or storage quarters; gas brackets are not allowed in buildings on his road. Mr. Pickering (B. & M.) spoke of whitewashing wooden roofs as a protective measure against fire. He said that on parts of his road it is required by insurance companies. The preservative and preventive effects will last from two to six years on good cedar shingles. Mr. Sheldon (N. Y., N. H. & H.) spoke of the practice of boarding up platforms to prevent the accumulation of combustible material underneath. While effective for that purpose, moisture does not dry out readily, and decay is therefore much more rapid. Mr. Rettinghouse told of an ore dock on the Great Lakes which burned recently, along which the fire traveled with incredible rapidity. In rebuilding the dock transverse partitions of matched lumber were placed every 200 ft. to prevent drafts and an automatic sprinkling system installed.

There was a printed report on subject No. 8, "Preservatives for Wood and Metals," but there was no discussion.

The only report by the committee on subject No. 9, "Coaling Stations and Cinder Pits," was the reading of a circular which will be sent out to members the coming year to obtain material for the next report.

A brief manuscript report on the final subject, "Records and Accounts," preliminary in nature, was read, and there was a short discussion. Mr. Reid (L. S. & M. S.) described a note book for bridge record field notes used on his road. It is of a size convenient for the pocket. They also have ruled sheets arranged to show the stresses in all members of each of their bridges under different loads. Mr. Killam explained a plan by which he had a description of every structure of the Intercolonial belonging to his department, and along with the description of each a record of each yearly inspection for the past nine years, the term of his service with the road. These data the road has had printed in book form.

The subjects for the next convention are:

1. Concrete bridges, arches and subways.
2. Experience and use of concrete piles.
3. Concrete building construction, including platforms.
4. Methods of watering stock in transit.
5. Recent practice in cofferdam work.
6. Modern coaling stations and cinder pits.
7. Bumping blocks for passenger and freight service.

The subjects for standing committees remain the same as for last year, except No. 9, which was transferred to the above list as No. 6.

EXHIBITS.

L. W. Barker, Clinton, Iowa.—Small working model of Barker mail crane.

Barrett Manufacturing Co., New York.—Barrett "Specification" roofing and waterproofing.

F. W. Bird & Son, East Walpole, Mass.—Samples of "Paroid" roofing.

The Philip Carey Mfg. Co., Lockland, Ohio.—Carey's magnesia flexible cement roofing and asphalt roofing paint for roofs, bridges, etc.

Paul Dickinson, Chicago.—Sample "Universal" cast-iron smoke-jack, and 40-in. circular section of "Vitribestos" smoke-jack.

Jos. Dixon Crucible Co., Jersey City, N. J.—Placards advertising Dixon's protective paint. Souvenirs.

The Eastern Granite Roofing Co., New York.—Samples of roofing. Large photographic views of buildings covered with this roofing.

Fairbanks, Morse & Co., Chicago.—New Duff roller bearing jacks, ratchet jacks, small model of standard hand-car and of Sheffield standpipe. Photographs of coaling stations, water stations, motor cars, etc.

H. W. Johns-Manville Co., New York.—Transite asbestos smoke-jack, asbestos roofing, pipe covering and other asbestos-magensia products. Electrical products.

The Lowe Brothers Company, Dayton, Ohio.—Lowe's red lead "Lute."

McClintic-Marshall Construction Co., Pittsburg, Pa.—Large photographs showing steel bridges, buildings, etc., built by this company. Also views of shops, recently extended to make combined capacity 120,000 tons a year.

National Roofing Co., Tonawanda.—Samples of "Security" brand roofing.

The Patterson-Sargent Co., New York.—This company distributed souvenirs and pamphlets showing views of the Thebes bridge, painted with its product.

Arthur E. Rendle, New York.—Sample "Paradigm" Skylight and side light.

The Sherwin-Williams Company, Cleveland, Ohio.—This company gave away handsome sterling silver souvenir spoons bearing the Sherwin-Williams trademark.

Standard Paint Co., New York.—Samples of "Ruberoid" roofing; photographs of buildings with roofing applied.

The United States Graphite Co., Saginaw, Mich.—Large colored sign advertising its product.

Heavy Ten-Wheel Locomotives for the Lehigh Valley.

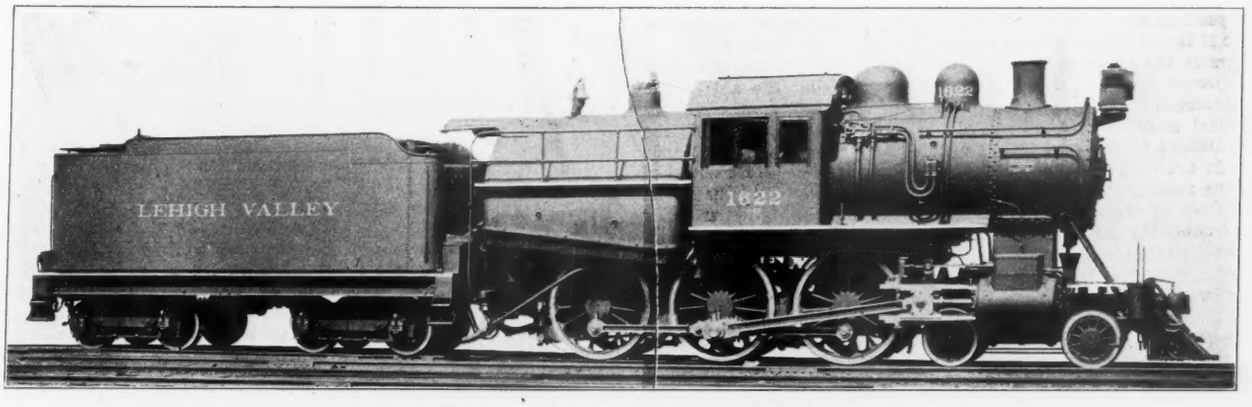
The American Locomotive Company has recently completed at its Schenectady works ten heavy 10-wheel (4-6-0) locomotives for passenger service on the Lehigh Valley Railroad. The engines are fitted with the Wooten boiler for burning fine anthracite, and weigh 199,200 lbs. in working order, of which 150,200 lbs. are upon the driving wheels. This is well up in the upper limits of the weights imposed on driving wheels for passenger service and is probably close upon the point where a permanent set will be given to the rail or tire or both on account of weight. The cylinders are 21 in. in diameter with a piston stroke of 28 in., and these give the machine a maximum tractive force of 31,380 lbs.

The engine is fitted with the plain flat slide valve instead of the piston type that is so extensively used with large cylinders. The boiler upon which the efficiency of the engine depends has an inside diameter of the smallest ring of 68 in. with plates $^{13}/_{16}$ in. thick. The firebox is carried by expansion plates at the front end resting on brackets on the frame. Just back of the center and at the rear it is supported by buckle plates of the ordinary type. The section of the fire-box shows the shape of the inner and outer plates which follow the practice of the past few years and swing in even regular curves from the mudring on one side to the other. These sheets are stayed by 25 rows of radial stays and two rows of sling stays at the front end. The former are set at right angles to the inner sheet which brings a number of them at a rather acute angle to the outer, but in no case so that a full thread cannot be obtained. The side sheets are held by the Tate flexible stays at the front, bottom and back. That is to say, the five vertical rows at the front and back and the four at the bottom are flexible. The balance forming the nest at the center and top are of the ordinary rigid type. These are shown on the engraving of the boiler by single circles while the flexible stays are indicated by double lines.

The following are some of the principal dimensions of these engines, in addition to those already given:

Heating surface, tubes	3,084.26 sq. ft.
" " firebox	199.98 "
" " total	3,284.24 "
Grate area	85.08 "
Axles, driving journals, diam.	10 in.; length. 12 in.
Axles, truck journals, diam.	5½ in.; length. 10½ in.
Steam pressure	205 lbs.
Fuel	Anthracite pea
Firebox, width	102 in.; length. 120⅛ in.
Water space, front	5 in.; sides and back. 3½ in.
Tubes, length	15 ft. 8 in.; diameter. 2 in.
Tubes, number	378
Piston rod, diameter	4 in.
Wheels, driving, diameter	68½ in.

The equipment includes the Westinghouse brake on engine and tender, with a 9½ in. pump. The tender has a capacity of 7,500 gallons of water and 12 tons of coal. The valves are of the Richardson balanced type and are set with a travel of 5¾ in. and a lap of 1 in.



Heavy Ten-Wheel Locomotive for the Lehigh Valley.

The Roundel Problem.*

BY DR. WILLIAM CHURCHILL.

Dr. Churchill discusses his subject under four heads: (1) The theory of light and color; (2) conditions encountered; (3) methods of test; (4) results. The paper fills thirty pages of the Proceedings of the association, and is of the nature of a treatise.† Under the theory of light and color he discusses light waves, light analysis, color constants (hue, saturation and intensity), complementary colors, color mixture, color contrast, light and colored glass, and the essentials of the best signal colors. Under the head of conditions, one of the most interesting is that of the quantity of light, which is affected by the type and size of burner, the spherical angle of light received by the lens, the size and design of lens, the type and efficiency of the reflector, the degree of accuracy with which the flame and lens are centered, and other things; but all these are passed by without discussion, though Dr. Churchill says that in many cases due attention to them would double or triple the efficiency of light. Under the head of atmospheric conditions fog is considered. From experiments made by the German Lighthouse Board it is shown that red is the poorest light to show through a fog. The light produced by a kerosene oil flame manifests more penetrative power in a fog than other kinds of artificial light. The German government tried powerful arc lights in a lighthouse, but they proved of far shorter range in fog than the oil lamp of less power, and were accordingly soon discarded. Other tests made by the German Lighthouse Board showed that the reduction of the power of lights in rainy weather was 30 per cent. Under the head of alinement of the semaphore lamp, Dr. Churchill discusses the size of the flame. The flame of the long-time burner is usually not over ¼ in. wide. [Mr. Rosenberg's experiments showed that it gives an efficient signal when it is only ⅞ in. high. In this connection, we understand that a long-time burner has been designed which will materially broaden the flame.—EDITOR.] Dr. Churchill finds that all colored roundels placed in front of a semaphore lamp shift in hue toward the red end of the spectrum as the observer recedes from the light. He speaks of the effect of smoke and the liability to mistake one light for another. A glass has lately been made at Corning which, with an oil flame, gives a "lunar white" light, and this is rather close in color to an arc light. But Dr. Churchill says that the impression produced by a semaphore lens, with its parallel beam, is so different from that received from the diverging light of the arc lamp that confusion probably would never arise.

Ten per cent. of the total light of a lamp, leaking through a

*Abstract of a paper read before the Railway Signal Association at its annual meeting at Niagara Falls, Oct. 11.

†Dr. Churchill confines the term "roundel" to the glasses in semaphore spectacles which usually are flat and colored.

crack in a colored roundel, may easily produce the effect of a "white" light.

Dr. Churchill describes his method of tests in great detail. He uses spectrophotometric analysis, photometric tests, tests by reducing lenses, and to confirm these, a range test; and, finally, a reaction-time test. In the latter, he measures the time required to recognize and name a signal. Averaging 100 experiments it is found that a certain observer required to distinguish and name a red signal 0.308 sec.; green, 0.335; yellow (amber), 0.358 sec.; yellow (light), 0.360 sec.; "white," 0.352 sec. The time was measured by a chronoscope, the observer calling off the color against a diaphragm which, by impact of the air, closed an electric circuit. Response by pressing a key required a longer time.

Under the head of results Dr. Churchill gives data from elaborate spectrophotometric tests of red, yellow, green, blue and purple glasses, and also of "lunar white" which has in it enough blue to make it white like an arc light, when used with a kerosene flame, while at the same time there is not so much blue but that the light will be visible as far away as the ordinary red or green light, say 2½ miles. With this glass, lights are found to be distinct in color as far as visible, whereas yellow, while it may be seen a considerable distance, is distinctive only a short distance. If a red glass should break, the pale yellow of the uncolored flame would be so different from the lunar white that it would not be mistaken for it, and the breakage would be discovered. The lunar white never becomes reddish, even in fog or smoke. It can perhaps be confused with an arc light; but it is believed that the effect of the lens in throwing the rays of a signal light in parallel or converging lines makes such a light so different from the ordinary arc light that confusion would never occur in practice. If lunar white were to be used in place of yellow, green signal lights might be made more yellowish than now.

In his closing paragraphs Dr. Churchill discusses, with favorable comment, the advantages of using two lights in signals. With yellow and red shown side by side the red looks deeper in hue than before. If yellow and green are shown together the hue of both seems intensified. An auxiliary light six or eight feet below a semaphore arm would increase the distinctiveness of the color displayed at the arm. The use of a yellow light is suggested for this auxiliary; and with this the indications would be red and yellow for stop, green and yellow for caution, lunar white and yellow for clear.

Loading Locomotives on the Equated Tonnage Basis.*

The proper method of rating and loading locomotives has been given more thought, study and demonstration in the past few years than perhaps any other one feature of railroad operation, and justly so, as it is the one important and difficult problem yet to be solved. Officers in the mechanical department have, after making hundreds of thorough and practical tests, with and without the aid of the dynamometer-car, given us the result of their efforts, from a strictly technical standpoint, and have demonstrated beyond a doubt the accurateness of the conclusions arrived at by them. The methods used in arriving at their conclusions vary, but the result obtained and the recommendations made all point to the one fact: that train resistance, or drawbar-pull, in lieu of gross tonnage is the only fair and economical basis for loading locomotives.

The mechanical department, having worked out and solved the problem, turn over the result of their efforts to the operating department, whose duty it is to put them into practice. Several plans are now in use on different railroads: Some provide for allowing an arbitrary five tons on each empty car; others provide for computing the tonnage by reducing it to pounds of drawbar-pull, and, again, others adjust the tonnage on the basis of the total number of cars in the train, for example:

An	engine	shall	haul	2,500	tons	when	in	35	cars.
"	"	"	"	2,400	"	"	"	40	"
"	"	"	"	2,250	"	"	"	45	"
"	"	"	"	2,100	"	"	"	50	"
"	"	"	"	2,000	"	"	"	60	"

Under all of these plans a vast amount of clerical work is required, from conductors, yardmasters and yard clerks, who at best are not very accurate in computing train tonnage, and the results obtained are more on an average basis than on handling each individual car and train on its own merit. It is my desire to present the matter from a strictly operating standpoint, avoiding as far as possible all technical formulæ.

Train resistance is made up of gravity and friction: gravity being the number and weight of cars taken as a whole train, causing additional drawbar pull on up grades; friction is made up as follows:

(1) Number of journals and weight carried on them, viz., journal friction.

(2) Number of wheels and weight on them, producing rolling friction with rail head.

(3) Resistance of wheels to change of direction on curves, viz., flange friction.

(4) Atmospheric friction and transverse wind pressure.

(5) Defects of rails, wheels, bearings, brakes, etc.

(6) Wave resistance of rail, varying directly with weight on wheels.

Another feature of train resistance not shown above, and one that to my knowledge has not been brought out in any of the several papers prepared on this subject, is that of improperly making up trains by placing the heavy loaded cars at the rear end of the train instead of at the head end near the engine. I mentioned this fact in discussing the subject at a meeting of the Central & Western Association of Car Service Officers, at Chicago, last year, and have since been advised by a representative of an eastern trunk line, that, after making several tests, they place this additional resistance at 10 per cent. when heavy loads are placed at the rear instead of at the head end of train. This factor is also demonstrated in the hauling capacity of a locomotive in passenger train service: The train has less drawbar-pull when the heavy sleepers are placed at the head end and lighter coaches at the rear. It is also clear that on momentum grades, with the heavy cars at the head end, it gives the engine a decided advantage in obtaining increased momentum to assist it up the ascending grade. It is a fact, also, that in curves, especially in reverse curves, a train with the heavy loads at the rear will bind harder than if they were placed at the head end.

This factor of resistance still further complicates the question of drawbar-pull and makes it necessary to not only take into consideration the gross weight of each car, but, also, its particular location in the train. Hence the true and correct basis to be used in equating or adjusting train tonnage is to consider the drawbar-pull of each individual car at each location in the train.

To adjust the drawbar-pull in this manner, it is necessary to

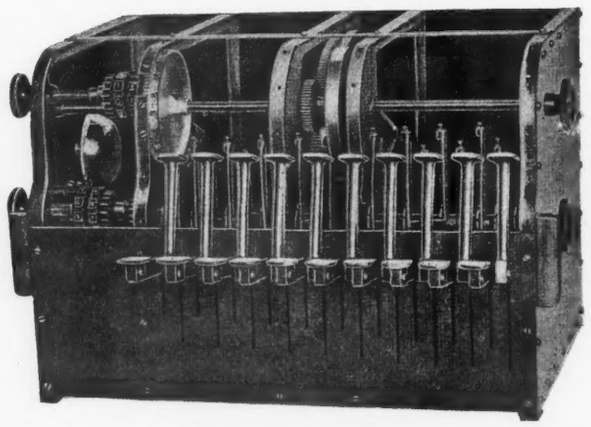


Fig. 1—Tonnage Rating Machine With Cover Removed.

determine by tests the drawbar-pull of each weight of car—for example, take ten 60-ton cars next the engine, then from the eleventh to twentieth car from engine, the same with other weights of cars for trains hauling a given tonnage, using the dynamometer car in making such tests. After determining the drawbar pull of each weight of car at different locations in the train, we then meet the problem of having the yard clerk, switchman, agent, or conductor, compile the tonnage and build up the train on that basis.

It is customary, as a rule, for the person producing such complicated theories or conditions to also produce at the same time a practical and feasible remedy to overcome them. I have perfected a computing device that automatically registers the number of cars in the train and adjusts the drawbar-pull of each gross weight of car at each location in the train, as outlined in this paper, and permits of computing this drawbar-pull from the billing on a train of 60 cars in 90 seconds, which is 1,800 seconds quicker than under the present practice.

Fig. 1 shows the train tonnage equating machine, which is constructed somewhat similar to a cash register. The case at the top and front is removed, to show the inner mechanism. The keys with numbers 15 to 70, arranged outside the case, represent the gross tons of car and contents, as shown on waybills. The numerals at the lower left-hand corner, represent the number of cars in train, the numerals at the left on top represent the drawbar-pull tonnage, equated from the actual tonnage. The bell at the left side sounds automatically when the limit of cars allowed on one train has been reached.

Fig. 2 is a side view. At the right attached to the large wheel is a clutch that grips the large wheel and causes it to move the distance the key moves down. This wheel causes the numeral wheel 0 to 99 to move sufficient to register the number of tons called for by the key employed. At the right on top is a compounding

*Extracts from a paper by J. M. Daly, Car Accountant, Illinois Central, read at the October meeting of the New York Railroad Club.

wheel on which numbers 0 to 99 are located, and alongside this wheel is a guide yoke with a small adjustable screw at the top, which is attached, and moves with the key in motion. The screw in the guide yoke comes in contact with the irregular face on the small cam wheel immediately under it and causes the key and numeral wheel to stop at a pre-determined point. This cam wheel has the irregular faces so arranged that when the numerals of "cars in train" and "tonnage" are set at "o" before starting to compute the tonnage, the shoulder at the highest point is immediately under the screw in the guide yoke—hence when the key for a car of 60 gross tons next engine is pressed down the guide yoke strikes the cam as set and the register shows 51 tons. A second operation of the same key register would show 102 tons.

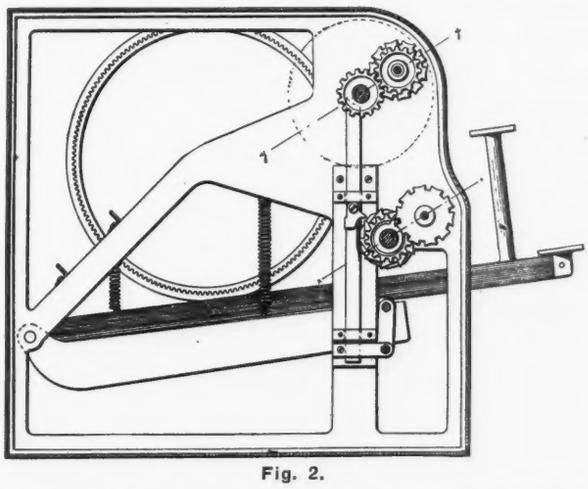


Fig. 2.

Then pressing key 15, it would show 119 tons. When a total of ten cars have been computed, be it the same key ten times, or ten different keys one movement each, the bar on which these cams are attached and carried revolves one-tenth, which causes a shoulder slightly lower than the first to come into position under each key, hence if you operate key 60 for the eleventh to twentieth car it moves a trifle farther before striking the cam and causes the register to show 52 tons instead of 51, and the 15-ton key would now register 18 tons instead of 17, this in order to provide for the additional drawbar-pull caused by distance of the car from the power. The irregular face on the cam wheel is cut or adjusted under each key to control the numeral wheel and cause it to register and record the drawbar-pull of any gross weight of the car at each location of the car in the train, thereby making proper allowance to the engine when heavy cars are placed at the rear and light cars at the head end of the train—in addition to automatically reducing the gross tons to drawbar-pull.

Fig. 3 is an end view showing at the top the tonnage numeral wheels, and at the bottom the wheel which records the total number of cars in the train and changes the position of cams at pre-determined intervals—every tenth or fifth car as desired.

This machine is intended for use in the office of the yardmaster where waybills are kept, and the tonnage to be computed on the machine by the clerk—a machine to be placed at ends of all train districts and at important intermediate filling-out stations, in order to not only adjust correctly the drawbar-pull of trains, but to take away from the trainmen the work of computing their tonnage and avoid all chance for error and light loading, which is invariably the case at present.

This machine also enables us to receive from each station where trains are made up or filled out, a correct statement showing the total number of cars in each train and their equated tonnage, and to detect immediately any failure to properly load engines.

To quickly and accurately adjust the drawbar-pull of a train is a decided advantage in getting trains out of congested terminals promptly after being made up, to say nothing of the advantage of preventing the overloading and underloading of engines, each being equally disastrous to roads—the former by delaying the train and causing it to double hills, possibly delaying other trains, and the latter by losing from 10 to 30 per cent. of the usefulness of the power by permitting it to move over the road light loaded.

The putting of 125 per cent. on one train and 75 per cent. on another is not economical or in line with good practice, even though the average is 100 per cent. This condition exists on a majority of roads that do not provide for equating the tonnage of cars of different gross weight and when engines are not properly rated.

Some roads, when rating locomotives, take a given tonnage, say 2,000 gross tons, if in 65 cars, and the engine used its maximum power to haul it within the time allowed, that then becomes its rating. Now, when that same locomotive has 2,000 gross tons in 30, 40 or 50 cars, it is permitted to move over the road light loaded from 10 per cent. to 35 per cent., and in most cases is a net loss to the road so operating.

It is impossible to build up all trains of equal average weight of cars; it is also impracticable to at all times place the heavy loads next to the engine, hence proper allowance must be made for each weight of car and its location in the train.

The use of block signals has made it even more imperative that locomotives be not overloaded, for the reason that overloaded trains invariably stall on heavy grades, which, in turn, blocks trains following them on the same grade where they should have the benefit of momentum to assist them, but when stopped they frequently are unable to again get their train in motion, resulting in being obliged to double the hill, delaying themselves, and possibly trains of a superior class.

Again, when trains are obliged to cross over or take siding to let others pass or meet, the drawbar-pull should be such as will permit the locomotive to handle its train with reasonable promptness on unfavorable grades or locations. When trains are overloaded to such an extent as to prevent their crossing over or taking siding promptly for trains of a superior class, it creates an element of danger, and it also tends to demoralize the train service.

Enginemen and conductors, after starting on a trip, do their figuring on meeting and passing points, basing their calculations on their train having a reasonable drawbar-pull; but when engines are frequently overloaded and the crews are obliged to double grades and delay other trains in crossing over, they lose confidence in the locomotive, resulting in their frequently laying back when they could and should go ahead and make their meeting point. Again, the confidence of men in charge of superior trains is shaken when obliged to frequently stop on flag signals or slow up for fusee or torpedo signals account of train ahead overloaded and in trouble. When locomotives, especially the large modern type, are overloaded and unable to make more than four or five miles an hour, it increases the tendency to slip, which results in more or less injury to the power.

To offset this condition, the demands constantly made on railroads by state and national legislatures to reduce rates make it imperative that each and every train haul the maximum tons per mile consistent with economic management.

The present plan of compiling statistics of tonnage hauled on a great many roads showing only the average per cent. of the potential hauled is crude and misleading, and does not permit of fair or intelligent analysis or criticism, and the fact that the data is not furnished to the superintendent of machinery, master mechanic, and superintendent, until 60 to 90 days after the service is performed, makes it difficult to locate the cause of failure, and renders it almost worthless.

The yardmaster's office at ends of all train districts and at filling-out points should be responsible to know that every train moving in the direction of heavy traffic is given its full potential tonnage, and that he compile a report each day showing the train number, engine number, time, weather conditions, temperature, rating in tons (drawbar-pull), and tons of drawbar-pull taken, and the cause of failure to take its full rating. A carbon copy of this report to be mailed each day to the division master mechanic, copy to the division superintendent, and a copy to the superintendent of transportation. The division master mechanic to watch for engines failing to take full rating on account of the condition of power, the division superintendent to watch for failure to give engines in proper condition their full tonnage, and the failure to keep a supply of cars at filling-out points to provide tonnage for trains to fill out with, and the superintendent of transportation to give

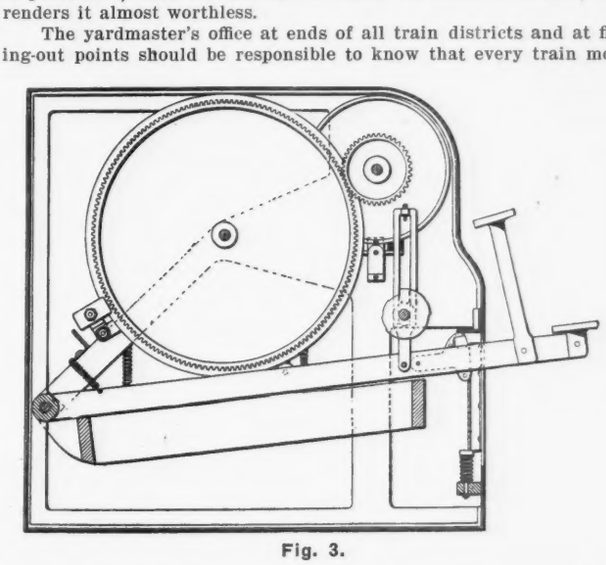


Fig. 3.

it general supervision. A recapitulation of each day's report to be a basis for a weekly report and each week's report to be the basis for a monthly report. In this manner all persons directly responsible will get promptly a daily report of each individual train from each individual filling-out station and the service it performs.

A record of this kind if kept at each point where trains are filled out, would enable the superintendent in charge to know to-day what each of his trains run yesterday hauled, and if any left a terminal with less than their assigned tonnage, then is the available and proper time to investigate it, while the matter is fresh and proper explanation can be made, instead of investigating in April, failures that occurred in February, the result of which is invariably a long list of plausible excuses, such as cold weather, snow, bad condition of power, congested yards, bad water, etc., which may or may not be correct, whereas had the investigation been made the following day, possibly a different result would have been obtained. Promptness in making investigation is very essential.

The tonnage footings on conductors' reports of to-day are very inaccurate. Imagine the average yardmaster or conductor, after taking the initials, numbers and seals, on 50 or 60 cars, also looking the cars over for defects, then go to the office and get his bills, enter the contents and tonnage of each car in his book, then try to foot up his tonnage correctly while standing at the counter along with others, trying to get his running orders and make out reports to the chief despatcher, showing the consist of his train. He has so many things to think about at one time that I am surprised he computes his tonnage as accurately as is done. A conservative estimate is that 70 per cent. of the reports so compiled are inaccurate, and some place it at 85 per cent. Invariably, the tonnage reported is higher than the actual tonnage hauled. What would be the result if we place additional burdens on the conductor by having him carry a chart with him to adjust or reduce from gross weight to drawbar-pull each car in his train? That is difficult for expert clerks to handle, in a comfortable quiet office, where their mind is constantly on the work of adding, but put them out in a yard in rain and snow, with the responsibility of a train on them, and their work in adding would be no better than that of the conductors.

Again, each part of a train district or division should receive independent and complete supervision, in order that the result of the whole may be successful, and the officer in charge should know that all trains moving over any part of his division in the direction of heavy traffic pulled their full rating, and reports of this kind will enable him to dispel any doubts from the minds of his superior officers that he is not moving his maximum tonnage at the minimum of expense. From these figures the officer in charge will have no trouble in determining where it will or will not pay to reduce grades.

I have laid particular stress on the overloading of engines for the reason that the company loses every time an engine is put on the line overloaded, either by delaying itself and others, or in damage to the engine from slipping and dragging over the road, making two trips where it should have made three.

Let us now consider the matter of underloading the power. The road operating over grades of less than 1 per cent. that loads its engines on a gross ton basis, making no allowance for light or heavy cars, loses from 10 per cent. to 25 per cent. in tonnage that should be hauled on at least 50 per cent. of its trains run. I have endeavored to emphasize the importance of full rating in *direction of heavy traffic*, for this reason: Take a district of 100 miles, the preponderance of traffic is eastbound. By failure to equate your tonnage, you lose 10 per cent. of the potential. The result is that on every ten trains run eastbound, you lose service equal to one train 100 miles. Your loss, however, does not stop there. On arrival of these trains at the east end of the district, they are not all required to haul the empty cars westbound, hence this engine and train crew move west, light, and the first failure to properly load trains results in a waste of 200 instead of 100 train miles.

The claim is frequently made, and justly so, that during periods of extreme heavy movement of traffic and during times when freight terminals are badly congested, it is an advantage to reduce the tonnage on trains so as to permit of getting them over the road in less time than if fully loaded. In other words, reduce them 10 per cent. and get five trips out of the engine where only four trips are possible with full tonnage. This, I believe, is the correct basis to work on, but should only be resorted to during times when conditions are as named, but during normal or light seasons the full rating should and can be economically hauled.

The traffic department uses these tonnage figures largely in determining the rates on certain commodities, and in furnishing it such information, care should be taken to show when this reduction is made. If it is not done, then we are deceiving ourselves.

This ratio would not hold good on roads hauling one commodity—such as coal—provided their cars are of about uniform capacity, as their test train would be about an average train; it does, however, hold good on roads handling various commodities, such as grain, lumber, coal, hay, cotton, merchandise and refrigerator-car traffic.

The large capacity car, both coal and box, reduces the cost of operation if properly handled, but so long as light, bulky commodities are shipped, just so long will we have the difference in drawbar-pull on light and heavy cars to contend with even when all cars are of uniform large capacity, and the method of basing on average performance will be as far as ever from securing the results we should obtain, and so long as trains will be made up with light loads at the head end, and heavy loads at the rear, no average plan can make provision for drawbar-pull in such cases, and no proper adjustment can be made unless this factor is taken into consideration.

The matter of adjusting the drawbar-pull of each gross weight of car at each individual location in a train, is made feasible and practicable by the aid of a mechanical device, hence it is not a theory but a condition that we have to contend with, and one that the mechanical and operating departments must join hands in meeting and overcoming.

Investigation of Private-Car Traffic.

At the hearing given in Washington last week, the Interstate Commerce Commission took testimony concerning private cars from Abraham Ellis, an ice manufacturer of Augusta, Ga.; J. H. Kerr, Manager of the American Refrigerator Transit Co.; A. G. Jackson, General Freight Agent of the Georgia Railroad; A. S. Dodge, Third Vice-President of the St. Louis & San Francisco; H. M. Emerson, Traffic Manager of the Atlantic Coast Line, and others. Mr. Ellis said that during this year's fruit season he sold to the Armour Car Lines 3,100 tons of ice at $3.50 a ton. The American Refrigerator Transit is owned by the Wabash, the Missouri Pacific, the Iron Mountain and the Southern railways. It operates 5,300 cars, of which 2,200 are leased. The contract of the refrigerator company with the Iron Mountain was put in evidence. It shows that the mileage paid by the road is one cent a mile and that the refrigerator company receives 12½ per cent. commission on the freight revenue on perishable goods carried in the refrigerator cars. Whether or not this is for services as soliciting agent does not appear. Mr. Kerr cited an example of a car of strawberries from Judsonia, Ark., to St. Louis (292 miles) on which the charge for icing was $50, while the actual cost was $54.75; but the mileage and commissions brought the receipts of the refrigerator company up to $65 a car. His company, he said, had paid no dividends.

Mr. Jackson said that the Georgia road carried in the season about 400 cars of perishable freight. The business was attended to by the Armour Car Lines under a contract. Mr. Dodge (Frisco) said that his contract with the Armour Lines forbade the use of other refrigerator cars on the road. Asked if the meat packers fixed the price of refrigeration as well as the freight charges, Mr. Dodge replied in the negative; that he "did not agree with Mr. Stickney and Mr. Ripley."

Mr. Emerson gave figures showing the reductions in the rates on berries from North Carolina to New York during the past 11 years, one example cited being a reduction from 64 cents to 27 cents. He insisted that the shippers dealt directly with the Armour Lines, the railroad not acting as agent of the car lines. To move the berries originating on the Atlantic Coast Line this year would have required 1,600 refrigerator cars, representing an investment of $2,000,000, which investment would not be productive except in the berry season.

Mr. Bowles, Freight Traffic Manager of the Illinois Central, testified that his road operates 2,458 refrigerator cars and has no agreement with private car lines. North of Cairo the Illinois Central pays one cent a mile for the use of refrigerator cars not owned by railroads. The mileage of refrigerator cars on the I. C. averages 44 cars a day, so that at 7½ mills, which is the rate paid south of Cairo, the hire of these cars is 13 cents a day more than for cars belonging to railroad companies, while north of Cairo the excess is 24 cents. Ten cars of berries shipped from Independence, La., to Chicago, were iced three times on the road and the cost of the ice used was $405.

Mr. Dixon, Freight Traffic Manager of the Pennsylvania Railroad, testified that his road owns 3,100 refrigerator cars.

Mr. Urion, Counsel for the Armour Lines, said that his company had paid out $80,000 on claims for losses suffered by strawberry shippers in North Carolina (presumably during the present year) because of inability to promptly furnish cars, and that claims for $60,000 were still being investigated.

Largely at the instance of the people in the iron and coal regions on the Rhine an express train between Berlin and Antwerp was put on, with through cars. The latter being little used, the leading business men of the coal towns feared that the train might be taken off, and the chambers of commerce united to pay the cost of advertising this train in the newspapers, hotels and otherwise. Imagine the Pittsburg and Philadelphia boards of trade paying for advertisements of a train from New York to Chicago!

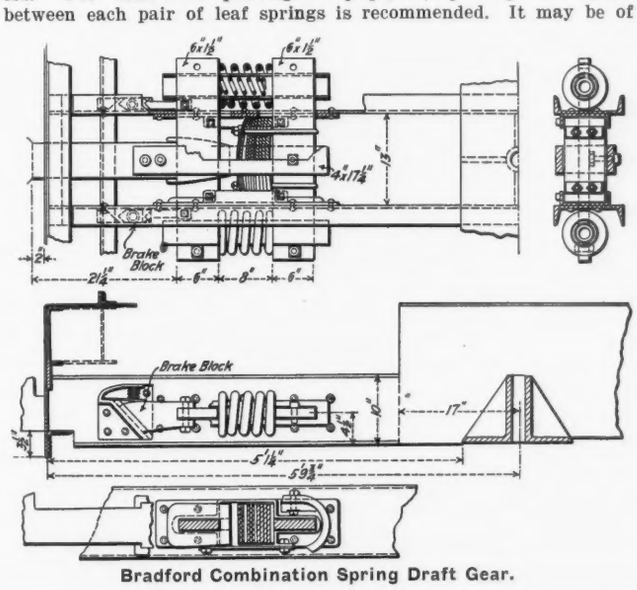
A Combination Spring Draft Gear.

A new design of draft gear brought out by the Bradford Draft Gear Company, Chicago, is shown in the accompanying drawing. It is designed primarily for steel cars, but is intended for use on any equipment where high capacity gears are required, it being possible to furnish the gears up to 300,000 lbs. capacity. It will be seen that the gear has two coil springs outside of the center sills, with transverse follower bars bearing against them front and rear. Between the center sills is a set of leaf springs arranged to come into action serially after the drawbar has traveled 1 in. against the resistance of the coil springs, which is one-half of the total movement of the drawbar. The leaf springs are held in position by U bolts passing around the rear follower. In compression they bear against a center block carried by the forward follower. The travel of the followers is so limited as to prevent breaking the springs or straining them beyond their capacity.

For cars of 100,000 lbs. capacity the builders recommend a spring power of approximately 200,000 lbs., as follows:

2 coil springs,	6¼ in. x 8 in.	38,000 lbs.
4 leaf springs,	¼ in. x 6 in. x 11½ in.	22,400 "
4 leaf springs,	⅜ in. x 6 in. x 11½ in.	49,600 "
4 leaf springs,	½ in. x 6 in. x 11½ in.	92,800 "
Total		202,800 lbs.

For passenger service a spring power of 100,000 lbs. is recommended, consisting of two coil springs of 38,000 lbs. capacity and 11 leaf springs ¼ in. thick with an aggregate capacity of 62,000 lbs. For first-class passenger equipment, placing a cushion between each pair of leaf springs is recommended. It may be of



Bradford Combination Spring Draft Gear.

felt, rubber or leather belting, the same size as the leaves, the object being to produce a noiseless and an easy yielding movement.

When desired, a device to take care of recoil is included with the gear. This is shown best in the side view of the gear. It is mounted on the outer side of each center sill web. These devices are called brake blocks by the designer. One block is rigidly secured to the sill and has on the edge, which is cut at an angle of 45 deg., a V-shaped slot in which moves the corresponding edge of the opposing block. The latter is secured to the front follower and the upward movement of this block against the fixed block is opposed by a single leaf spring and a coil spring above. The device can be applied or removed whenever desired without otherwise affecting the efficiency of the gear.

A Month's Record of Automatic Signals in the Subway.

The New York City Subway of the Interborough Rapid Transit Company has now been in operation one year, and the number of automatic signal movements for the eleventh month (September) was about five millions. The number of signal failures in that month, all on the side of safety, was 11, which is an average of one failure to 464,694 movements. With this enormous movement there was, it will be seen, not a single relay failure. Three of the 11 failures shown were caused by water leaking through the roof, where the road runs beneath the northwest corner of Central Park, the water causing the burning out of fuses at signals. The causes of the failures are shown in the accompanying table. The table is shown complete, from which the reader can see what are the principal kinds of mishaps resulting in signal failures which have been brought to light in the operation of this road. It will be observed that the record includes not only the signals but the automatic stops.

The third section of the table, that devoted to failures of switches, has to do, of course, with the interlocking plants. Of these plants there are 36. The only one of these failures chargeable to the signal department is the last one—water in the sub-station. This was surface water which accidentally got into the intake of one of the air compressors.

This report is a summary of the reports of 13 inspection districts. In each district a repairman is always on duty. The longest district or section is about 1½ miles long. Ten sections report no failures. The whole report represents 55 miles of track. The four-track part of the road, which has a continuous block system on the express tracks, is eight miles long. The number of movements at the interlocking plants is not made a matter of precise record, but at the busiest junction, during the hours of heavy traffic, the number of trains is 125 an hour. This means 250 switch movements an hour; at least 250 signal movements and 125 movements of automatic stops.

Failure Report, Month Ending Sept. 30, 1905.

Causes of failures.	Failures.	Delays.	Causes of failures.	Failures.	Delays.
Signals:			*Automatic stops:*		
A.-C. relay	..	..	Broken wire	1	2
Broken wire	..	..	Frozen valve	..	..
Broken track wire	..	..	Loose wire	..	..
Burned pipe	..	..	Low air pressure	..	..
Broken grid	..	..	Imperfect lubricat'n	..	..
Careless repairman	..	..	Mechanical trouble	..	..
Fuse	3	1	Stones	..	..
Frozen valve	..	..	Ties shifted	1	1
Insulated joint	3	5	Unknown	..	..
Loose wire	..	..	Leaky valves	..	..
Low A.-C.	..	..	Total	2	3
Low D.-C.	..	..	*Switches:*		
Low air pressure	..	..	Broken cylinder	..	..
Lights out	..	..	Broken wire	..	..
Imperfect lubricat'n	..	..	Bad points	..	..
Transformer, short-circuit primary	1	2	Frozen valve	..	..
Train ran by signal	..	..	Loose wire	..	..
11,000-v. main brnd.	..	..	Low air pressure	..	..
Unknown	..	..	Imperfect lubricat'n	..	..
Leaky valves	..	..	Obstruct'n in points	..	..
Poor spring contact:			Out of adjustment	..	..
On machine	1	1	Switch run through	3	4
On home signal	1	..	Indication spring	..	..
Total	9	9	Water in sub-stat'n	1	2
			Total	4	6
			Grand total	15	18

Train Accidents in the United States in September.[1]

unx, 1st, Erie road, Great Notch, N. J., an empty engine running backward was derailed at a switch and fell down a bank. The engineman, fireman and baggageman, the latter riding on the pilot, were injured.

rc, 2d, Maine Central, South Gardiner, Me., a passenger train standing at the station at a time of dense fog, was run into at the rear by a following passenger train and one passenger car was wrecked. Twenty passengers were injured, many of them being scalded by steam from the engine.

unf, 3d, Atchison, Topeka & Santa Fe, Boone, Colo., a passenger train was derailed and 12 passengers were injured.

unx, 3d, Arkansas & Choctaw, Durant, Ind. T., a freight train was derailed at a switch and the engine and five cars were ditched. The fireman was killed and the engineman fatally injured.

†xc, 5th, Chicago, Burlington & Quincy, Brush, Colo., a passenger train was run into by a freight train, the engine of which struck a sleeping car in the side and wrecked it. One passenger and two employees in this car were killed. One other car was wrecked and 15 passengers were injured.

bc, 7th, Pennsylvania road, Wilmington Junction, Pa., butting collision between a regular and an extra passenger train; one engineman and one fireman were killed and many passengers were injured.

bc, 7th, 3 a.m., Illinois Central, Obion, Tenn., butting collision of freight trains, one of which had run past the appointed meeting station. Four trainmen were killed and four injured. The collision occurred on a bridge and both engines and 19 cars fell into Obion river.

bc, 8th, Pere Marquette road, Zeeland, Mich., butting collision between a northbound freight train, running at high speed, and a

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will, as a rule, be omitted from this list. The official accident record, published by the Interstate Commerce Commission quarterly, is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defects of roadway.
eq	Derailments; defects of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

southbound train consisting of an engine and a caboose. Both trains were badly wrecked and three trainmen were fatally injured.

rc, 9th, Philadelphia & Reading, Tabor Junction, Pa., a local freight train standing at the station was run into at the rear by a through freight, wrecking the engine, caboose and several cars. The boiler of the locomotive exploded or was in some way ruptured and the engineman was fatally scalded. Two other trainmen were killed.

bc, 9th, 2 a.m., Baltimore & Ohio, Fairmont, W. Va., butting collision of freight trains, both running at full speed; six trainmen were injured.

xc, 12th, Pennsylvania road, Creighton, Pa., passenger train No. 402 ran over a misplaced switch and into the head of a freight train on a side track, damaging both engines; three passengers injured.

unx, 12th, Wiscasset, Waterville & Farmington, Head Tide, Me., the engine of a passenger train was derailed on a curve at an approach to a trestle bridge and, running some distance on the ties, broke through the bridge. Several passengers were slightly injured. The engineman and fireman jumped into the water and escaped.

bc, 13th, Cleveland, Cincinnati, Chicago & St. Louis, Marion, Ind., a gravel train consisting of an engine and 10 cars, with the engine at the rear, running at good speed, collided with a freight train, consisting of a switching engine and 10 cars, making a bad wreck. Two employees were killed and three were injured.

dr, 15th, Southern Indiana, Huntingburg, Ind., passenger train No. 2 was derailed by spreading of rails and two cars were overturned. One passenger and the express messenger were seriously injured and 15 other passengers slightly.

xc, 16th, Baltimore & Ohio, Kimmel, Ind., passenger train No. 14, running at full speed, struck a locomotive standing on a side track, but not clear of the main line, and the first three cars of the passenger train were wrecked. The engineman and baggageman were killed and 20 persons were injured.

unf, 16th, 9 p.m., San Antonio & Aransas Pass, San Antonio, Tex., passenger train No. 4 was derailed by a malicious obstruction; the engine was overturned and the fireman killed. Many passengers jumped out of the windows but all escaped with slight injuries.

unf, 17th, 1 a.m., St. Louis, Iron Mountain & Southern, Ironton, Mo., southbound passenger train No. 5 was derailed at a washout, and two engines and five cars fell into a creek. The engineman and fireman of the second engine were killed and the engineman of the leading engine was fatally injured. Twelve other persons were injured.

unf, 17th, Tombigbee Valley, Fairford, Ala., a freight train consisting of 12 cars of logs and a locomotive, with the locomotive at the rear, was derailed by running over a cow, and the conductor, who was on the leading car, was killed.

unx, 18th, New York Central & Hudson River, Fifty-sixth street and Fourth avenue, New York City, a parlor car in a northbound passenger train of the New York, New Haven & Hartford was derailed and overturned at a switch and eight passengers were injured. The overturned car ran against one of the columns supporting the roof of the tunnel at that point and was badly wrecked. The train was running slowly at the time.

bc, 19th, Southern Pacific, Beowawe, Nev., butting collision of freight trains, wrecking both engines and several cars.

rc, Passenger train No. 3, following the westbound freight, was stopped in consequence of the stoppage of the freight, and a few minutes later was run into at the rear by second No. 3, wrecking the engine and one passenger car. In both accidents one man was killed and 25 other persons were injured.

xc, 19th, Pennsylvania Lines, Ashtabula Harbor, Ohio, collision of freight trains in the yard, wrecking two engines; one engineman killed.

20th, Atchison, Topeka & Santa Fe, Walton, Kan., an eastbound passenger train running at full speed was derailed, and the dining car and one sleeping car were overturned. Four passengers and one employee were injured, the latter probably fatally.

bc, 21st, Philadelphia & Reading, Moor's Mill, Pa., butting collision between a passenger train and a pay car train, making a bad wreck. Five employees were killed and 10 injured, and the express messenger was fatally injured. The men in charge of the pay train miscalculated the time.

bc, 21st, Baltimore & Ohio, Kingsmont, W. Va., butting collision of freight trains, one of which was running at high speed. Both engines and 10 cars were wrecked and five trainmen were injured.

unx, 21st, Nacogdoches & Southeastern, Hayward, Tex., a passenger train was derailed and one man was killed.

unx, 21st, Chesapeake & Ohio, Carkin, W. Va., passenger train No. 35 was derailed at a curve and several cars were wrecked. The express messenger was killed and three passengers were injured.

bc, 22d, New York, Chicago & St. Louis, Sheffield, Ohio, butting collision of freight trains, ditching one of the engines and 30 empty freight cars. Two trainmen were injured.

bc, 22d, Midland Terminal, Victor, Colo., butting collision in the yard between an empty engine and a train consisting of an engine and one platform car. One fireman was killed and two other trainmen were injured.

bc, 23d, Oregon Short Line, Eaton, Idaho, butting collision between a westbound passenger train and an eastbound freight. The fireman of the passenger train was killed and three other trainmen were injured. Both engines were wrecked.

unx, 23d, 1 a.m., Southern Railway, Campton, S. C., passenger train No. 14 was derailed and one passenger car was overturned. Seven passengers were injured.

xc, 24th, Erie, Susquehanna, Pa., passenger train No. 14 collided with a locomotive in the yard and both engines were overturned. The passenger engineman was killed and two other employees were fatally injured.

rc, 25th, 3 p.m., Pennsylvania, Paoli, Pa., an eastbound local passenger train which had just drawn up to the station (empty) to begin its trip to Philadelphia, was run into at the rear by a following express train and the rear car was wrecked. This was the general manager's car, being run on a short trial trip after having been overhauled in the shops, and it was occupied by employees of the shop department and two guests who were interested in new lighting apparatus which had just been put into the car. Three of these employees and one of the guests were killed and 23 persons were injured (of whom two subsequently died), some of them in this car and some of them passengers in the express and local passenger trains. The local train had just passed through crossovers from track No. 4 to track No. 1, and the express train, approaching rapidly on track No. 2, followed the local closely, before the signal man was able to straighten the switches. A few rods back the express train had passed from track No. 1 to track No. 2, this being the usual procedure for running the express train past the local passenger and other trains on track No. 1, and it appears that the engineman of the express mistakenly assumed that the signal which gave him the route from track No. 1 to track No. 2 gave him a clear route through the yard. Having thus assumed, he approached the stop signal, which should have kept him from entering the crossover, at a rate of speed too fast to admit of bringing the train to a stop. This accident was reported in the *Railroad Gazette* of September 29. From the coroner's investigation, held on the day following the collision, it appears that the inability of the signal man to reset the crossover switches after the passage of the local train was due to the presence of the rear car of that train on the detector bar, the train having been stopped too soon. Engineman Broomall, of the express, said that his view of the signal which should have stopped him was cut off by a cloud of steam emitted by a passing freight train. Just as Broomall passed the stop-signal his fireman discovered the error and shouted to him, and at the same moment the whistle on the signal tower was sounded. He then applied the brakes and sanded the rails, but was too late. He says that he was running about 18 miles an hour.

xc, 25th, Woodstock, Ala., a northbound freight train of the Alabama Great Southern ran into the side of a passenger train of the Louisville & Nashville, at the crossing of the two roads. The conductor of the passenger train was killed and 27 passengers were injured.

dr, 26th, Rio Grande Southern, Glencoe, Colo., a mixed train was derailed by spreading of rails and all of the cars were overturned. The train was running at moderate speed. Ten passengers were injured.

unf, 26th, Missouri, Oklahoma & Gulf, Muskogee, Ind. T., a construction train was derailed by running over some cattle, and the engine was overturned. The conductor and the engineman were killed.

unx, 26th, Texas Central, Morgan, Tex., a freight train was derailed and the engine was overturned; engineman killed, fireman and one brakeman injured.

*rc, 27th, Cincinnati, Hamilton & Dayton, Glenwood, Ind., a passenger train ran into the rear of a preceding freight, wrecking the engine, caboose and two freight cars, which took fire and with two passenger-train cars and four cars on the side track were burnt up. A tramp was burnt to death and two trainmen and six passengers were injured.

dr, 28th, International & Great Northern, Navasota, Tex., a passenger train was derailed by spreading of rails, and one passenger car fell down a bank. Six passengers were injured.

rc, 29th, Norfolk & Western, Lurich, Va., a freight train standing at the station was run into at the rear by a following freight, and six cars were wrecked. The engineman was killed and two other trainmen were badly scalded.

rc, 29th, Atlantic & Birmingham, Brunswick, Ga., a local freight train which had stopped to leave some cars was run into at the rear by a through freight train, drawn by two engines, wrecking two engines and several cars. Two trainmen were fatally injured.

bc, 29th, West Virginia Central & Pittsburg, Dodson, W. Va., butting collision between passenger train No. 1 and an empty engine. One engineman killed, two other trainmen injured.

GENERAL NEWS SECTION

NOTES.

It is announced that after November 5 the time tables of the Michigan Central east of Detroit will show Eastern time instead of Central time, as now.

When an officer of the Pennsylvania road goes to Pittsburg in his private car a telephone in the car is connected with the railroad and city exchanges immediately on arrival.

The Globe Express Company, which does business on the Denver & Rio Grande and other railroads in Colorado, is to take the express contract of the Western Pacific. Among the directors of the Globe Express Company are George J. Gould, E. T. Jeffery and C. H. Schlacks.

At White Plains, N. Y., October 18, Albert Woods and his wife were sentenced to imprisonment, one for at least three years and the other for at least two years, for perjury, in making a fraudulent claim against the New York City Railway for personal damages. Woods was conductor of a car and Mrs. Woods claimed to have been injured because of the sudden starting of the car. They pretended not to know each other. Two New York lawyers have been arrested for aiding the Woodses in their frauds.

The Canadian Pacific announces a change in the handling of its sleeping, parlor and dining cars. Henceforth this service, west of Fort William, is to be operated as a separate department, and William Bell, District Superintendent, will report to William Whyte, Second Vice-President, at Winnipeg, instead of to the sleeping-car superintendent at Montreal. There will be superintendents at four points between Winnipeg and Vancouver, and each will keep a stock of supplies. Dining cars and buffet cars will also be put in service on several of the branch lines of the western district. The change is to secure closer inspection and improved service. All operating departments of the western lines are now under the direct management of Mr. Whyte, who reports only to the president.

Hearing on the Air Brake Law.

Secretary Edward A. Moseley, of the Interstate Commerce Commission, announces that the hearing on the question of increasing the minimum percentage of power brakes in trains, to be held in accordance with a former notice of the commission, is to take place at the office of the commission in Washington on Thursday, Nov. 2, at 10 a.m., at which all persons interested may appear either in person or by counsel. In accordance with the former notice, the commission has gathered data from the railroads throughout the country showing the number of freight cars owned and the number air-braked, together with statements as to the actual percentage of air-brakes used in the freight trains of the respective companies during a period of six months. The minimum percentage of air-brakes in use, now required by the law, is 50; under the Act of March 2, 1903, the commission may order an increase in this minimum percentage requirement.

Railroad Strike in Russia.

A strike of railroad employees on the four principal railroads centering in Moscow, Russia, which began last week, has become extensive and the railroad men in St. Petersburg are preparing to strike, if they have not already done so. Traffic to and from Moscow is said to be almost at a standstill. Press despatches say that the strike is largely political, the socialist leaders desiring to show their strength.

Sierra Leone Government Railroad.

This road, the construction of which was begun in 1896, has been completed from Freetown, on the west coast of Africa, to Baiima, 222 miles, and was recently handed over to the Government, the Colony of Sierra Leone being under British administration. The road was made narrow gage, 2 ft. 6 in., to reduce the expense of construction, the traffic being expected to be light for some years to come. The traffic is, however, increasing rapidly, as the country tapped contains large quantities of rubber, palm oil and other vegetable products. The maximum curvature on the main line is 8 deg. 40 min. and the maximum grade 2 per cent., but there is a five mile branch on which the grade runs up to 4.3 per cent. The first 32 miles out of Freetown are laid with 28-lb. rails and 30-lb. rails are used on the rest of the line. The ties are of steel, weighing 35 and 40½ lbs., according to the weight of the rails, and the ballast is gravel and broken stone throughout. Owing to the good quality of this ballast, little difficulty has been found in maintaining the track in spite of the heavy rainfall, which averages about 175 inches annually. Temporary bridges were built of native wood and replaced in about two years by steel and concrete structures. Arch culverts and abutments for open culverts are also of concrete. The Séwa and Moa bridges are the most important. They are supported on concrete piers and the girders are of the half-through or partial deck type. This type has the advantage of retaining the cross bracing and giving good headway for a given depth of girder, while it is not so costly as the through type, owing to the shorter distance between girder centers. Prairie (2-6-2) and six-wheel coupled locomotives are in use and have so far proved satisfactory.—*The Engineer.*

Dust Guard Slots in Journal Boxes.

The discussion at the September meeting of the Railway Car Foremen's Club of Chicago, on the question whether journal boxes having the dust guard slot opening at the bottom are preferable to boxes which have the dust guard slot opening at the top, brought out the fact that if the dust guard slot of a journal box is closed at the bottom, the dust guard is liable to be broken against the bottom of the slot when a box is jacked up to remove a brass. The dust guard slot if closed at the bottom accumulates dirt, which would free itself if the slot was open at the bottom. The wooden wedge for closing the dust guard slot is liable to dry out and become lost, and if this happens, more dirt will go into the dust guard slot if open on the top than if open at the bottom. The liability of wasting oil from the back of the box is not increased if the dust guard slot is opened at the bottom, as the inside wall of the dust guard slot prevents the oil from flowing into the dust guard well from the box. If too much oil is placed in a box so that it runs out at the rear end, even if the dust guard slot is closed at the bottom, the oil will soon run over the outside wall of the dust guard well because the dust guard occupies the space in the dust guard well immediately under the axle. The question of eliminating the inside dust guard wall was subjected to M. C. B. letter ballot this year, but was rejected. Of course, if this inside dust guard wall had been eliminated it would be necessary to have the dust guard slot of journal boxes open at the top in all cases.

Milan Exposition of 1906.

To celebrate the completion of the Simplon tunnel an International Exposition under royal patronage is to be held in Milan, Italy, from May to November, 1906, and it is said that it will be the largest European Exposition ever held outside of Paris. Practically all of the European countries will participate officially, as well as several Asiatic nations.

In the transportation section, retrospective exhibits will show the historical development of the various methods of travel. The dominant feature will be Motion. All products, as far as possible, must be shown in connection with the processes. For the automobile display an entire pavilion will be set apart. This part of the show will terminate in mid-summer so that machines exhibited may be sold for early delivery. Italy is now prosperous and a large attendance at the Exposition is confidently expected. Genoa, the port of entry, is less than 100 miles distant. The cost, therefore, of transporting exhibits from the United States will be comparatively cheap. For terms of space or further information, application should be made to J. H. Gore, George Washington University, Washington, D. C.

The Executive Committee of the Exposition offers a prize of 5,000 francs for a car-coupler to fulfil certain requirements; one of them, which has least engaged attention in this country, is the ability to use it with cars provided with two buffers at each end, such as have been universal in Europe until recently. Competitors must announce their intention to compete by Dec. 31 next.

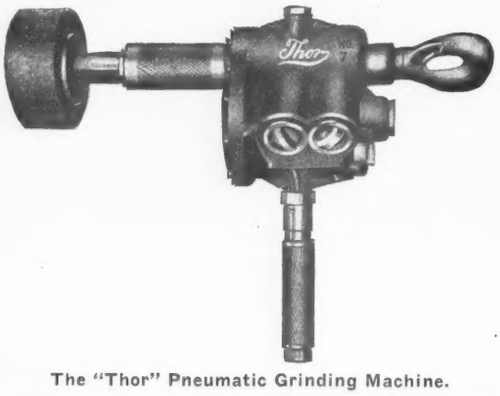
The We-Fu-Go Water Softening and Purifying System.

In order to provide suitable water for its 4 power-house boilers at its Jenison (Mich.) power house, the Grand Rapids, Holland & Chicago Railroad Company had installed a We-Fu-Go water softening and purifying system made by Wm. B. Scaife & Sons Co., Pittsburg, Pa. A creek about 250 ft. from the power house has been the source of supply for the last three years, and under the old system it was necessary to clean the boilers every two weeks, but since the installation of the new system one cleaning a month is all that is necessary to keep the boilers in good condition. Even this would be unnecessary were it not for the chemical action on the scale which is dropping off in large quantities. At one cleaning from 400 to 600 lbs. of scale has been removed, and at this rate, according to the engineer in charge, it will not be necessary to clean the boilers at all during the season of heavy traffic next summer. Two tanks made of cypress wood, 14 ft. high, having a diameter of 16 ft. at the bottom

and 14 ft. 8 in. at the top, with a capacity of 17,000 gallons each are placed on a platform about 6 ft. high. A small tank of 65 gallons capacity is placed on the top of another platform about 18 ft. or 20 ft. above the first. A chemical solution of lime and soda ash is allowed to run from the small tank into one of the larger ones while it is being filled from the bottom with water. The quantities of lime and soda ash required vary with any change in the water, a very simple means of testing the water is provided with the plant which enables the engineer to easily determine the quantities of each required. It requires an hour and 10 minutes to fill one of the large tanks with the present pump, which is not pressed to its full capacity. During the time of filling a paddle revolves in each tank to disseminate the chemicals. A 2½-h.p. motor located on the first platform furnishes the power necessary to operate a 2-ft. paddle in the small tank and a 12-ft. paddle in the larger. The large paddle makes about eight revolutions a minute. While the pure water in one tank is being utilized the other is being filled. During the season of heavy traffic about 60,000 gallons of water is used by the boilers, and it is estimated that since the water has been treated by this system about 6 tons of coal a day have been saved. The cost of installing the above plant was about $2,500.

The Thor Pneumatic Grinding Machine.

The Independent Pneumatic Tool Co., Chicago and New York, has just placed on the market a new air machine, designated as the "Thor" pneumatic grinder No. 7, designed for grinding, polishing and buffing purposes. The machine is of the reciprocating piston type, having four pistons, direct acting on the crank, and is equipped with the "Thor" Corliss valve motion. The grinding spindle proper is held in a housing extended from the end of the motor in line with the crank shaft, and runs at approximately 3,000 r.p.m. It is not a part of the crank shaft, however, but is connected with it. The grinding spindle runs on bearings that are



The "Thor" Pneumatic Grinding Machine.

a combination of ball and plain bearings. There is a large bronze bearing next to the motor, and adjacent to this is fitted a four-point ball-bearing which acts as a thrust bearing both ways, and also as a support for the shaft. At the outer end is a metallic packing that also acts as a bearing, and at the same time prevents the lubricating oil from running out of the machine. A grip handle placed in line with the grinding spindle, and the outside of the housing of the grinding spindle, serve as handles. Mandrels of any suitable length or shape may be attached to the grinding spindle for driving emery wheels, soft polishing wheels or discs. The machine weighs about 20 lbs. and consumes approximately 20 cu. ft. of free air per minute. Several large plants have made exhaustive tests of these machines and claim that they have given entire satisfaction.

Accident Bulletin No. 16.

Accident Bulletin No. 16, just issued by the Interstate Commerce Commission for the months of April, May and June, shows 41 passengers and 221 employees killed, and 1,253 passengers and 1,511 employees injured in train accidents. Other accidents bring the total number of casualties to passengers and employees up to 14,669 (886 killed and 13,783 injured). For the year ending June 30, 1905, there is an increase of 117 in the number of passengers killed and an increase of 11 in the total killed of both passengers and employees. In coupling accidents, the total number of deaths in the year, 243, is 35 less than for the year preceding, and the number of injuries, 3,110, is 331 less; while the number of men employed is estimated to have been 9 per cent. greater than the year before.

Manufacturing and Business.

The Mount Vernon Car Manufacturing Co., Mount Vernon, Ill., has enlarged its car wheel foundry capacity so that 400 wheels can be made daily.

The Pennsylvania Railroad Company has placed an order with the Westinghouse Machine Company for six 132 in. x 26 in. grate and four 100 in. x 20 in. grate Roney mechanical stokers for its Altoona shops.

The Kennicott Water Softener Co., Chicago, is building 18 steel storage tanks of the Harriman pattern, capacity 65,000 gals. each, for the Union Pacific.

The Hurley Track-laying Machine Company, Syracuse, N. Y., has recently placed a track-laying machine with the Streeter & Lusk Contracting firm on the Chicago & North-Western work between Manitowoc and Gillett, Wis.

The Dayton Pneumatic Tool Co., Dayton, Ohio, has received orders for 30 No. 3 "Green" chipping hammers from the Jones & Laughlin Steel Co., Pittsburg, Pa., and 38 "Green" hammers of miscellaneous sizes for shipment to Japan.

The National Machinery Company, Tiffin, Ohio, maker of bolt, nut and wire nail machinery, states that it has received a number of orders from various railroad companies for its threading and tapping machines, as well as for its upsetting and heading machines, in which it has made some radical improvements in design.

A "jarless" pneumatic hammer is being placed on the market by the Helwig Mfg. Co., St. Paul, Minn., maker of pneumatic tools and other labor-saving devices. It is claimed that owing to the lack of vibration in this hammer there is no strain on the user and for that reason it increases the working capacity of every operator. The 9-in. stroke hammer, which weighs but 14 lbs., rivets up to 1¼ in.

The Sherwin-Williams Paint Co. has opened a branch house in Cincinnati, Ohio, at 416-422 Pioneer street, making 13 branch houses in addition to its five large plants. A circular announcing the fact shows views of important plants and branch houses of the company, and gives other information relative to the scope of the business done, methods, product, etc., and detailed information about the new Cincinnati branch.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Canadian Ticket Agents' Association.

At the meeting of this association in Portland, Me., October 16, W. Bunton, Peterboro, Ont. (Grand Trunk), was elected President.

General Passenger Agents.

At the annual meeting of the American Association of General Passenger & Ticket Agents, held at the City of Mexico, October 17, A. J. Smith, of the Lake Shore & Michigan Southern, was elected President and C. L. Stone, of the Louisville & Nashville, Vice-President; and C. M. Burt (Central of New Jersey), of New York City, was re-elected Secretary. The next meeting is to be held at Atlantic City, N. J.

Society of Naval Architects and Marine Engineers.

The thirteenth annual meeting of this society will be held at 12 West 31st street, New York, November 16 and 17, to be followed by a banquet, November 17, to which members and their guests are invited. The papers to be read are as follows:

"Problems in Ferryboat Propulsion," by Col. Edwin A. Stevens, Vice-President.
"Ventilating Fans and Pipes," by Naval Constructor D. W. Taylor, U.S.N.
"Action of Screw Propellers," By Prof. Wm. F. Durand.
"Tests of Model Propellers," by A. V. Curtis and L. F. Hewins.
"The Cruisers," by Commander William Hovgaard, Royal Danish Navy.
"Comparison of Recent Battleships," by Naval Constructor H. G. Gilmor, U. S. N.
"'The Ultima,' a Globular Naval Battery," by Anson Phelps Stokes.
"A Tale from Japan," by George W. Dickie.
"Longitudinal Bending Moments of Certain Lake Steamers," by W. I. Babcock.
"Steam Boiler Troubles," by Horace See.
"Water-tight Bulkheads for Battleships and Cruisers," by Harold F. Norton.
"Marine Turbine Propulsion," by Charles G. Curtis.
"Marine Steam Turbine Developments," by E. M. Speakman.
"How a Ninety-footer Behaves in an Ocean Race," by Paul Eve Stevenson.
"High-Speed Launches," By Clinton H. Crane.
"Speed Trials of the Gasolene Launch 'Ludo.'" by George Crouse Cook.
"Scantling Regulation in Yachting," by W. P. Stephens.

PERSONAL.

—Mr. H. S. Storrs, General Superintendent of the Lake Shore & Michigan Southern, died of paralysis at Cleveland, Ohio, on October 25.

—Mr. J. H. McWilliams, who has been appointed General Freight and Passenger Agent of the Georgia, Florida & Alabama, began his railroad service in the Traffic department of the Chicago, Milwaukee & St. Paul at Council Bluffs, Iowa, in 1891. In 1897 he went to the Atlanta, Knoxville & Northern as traveling freight and passenger agent. In 1900 he was made General Passenger Agent of the same road and General Freight and Passenger Agent in 1902. When the road was absorbed by the Louisville & Nashville on Jan. 1, 1905, he was made traveling freight agent in Tennessee of the latter road, leaving this position to accept his recent appointment.

—Mr. J. F. Simms, who was recently appointed Superintendent of the Central Kansas division of the Missouri Pacific, was born in Mississippi in 1866. After being employed in various places in the South as agent and operator he became in 1889 night operator of the St. Louis, Iron Mountain & Southern. He was made train despatcher in 1890 and the next year was transferred to the Missouri Pacific with the same title. In 1895 he was made chief despatcher and in 1901 Division Superintendent at Concordia, Kan. Two years later he was transferred to the Eastern division. On Jan. 10, 1905, all Division Superintendents' titles were changed to trainmaster, and he was therefore trainmaster at Sedalia, Mo., at the time of his present appointment.

—Mr. F. E. Herriman, who was recently appointed to the new position of Coal Traffic Manager of the New York Central, began railroad service in 1874 as clerk to the superintendent of the Cincinnati, Sandusky & Cleveland, and served consecutively as secretary to the general manager, assistant to the president, and purchasing agent of that road and coal and lumber agent of the Chesapeake, Ohio & Southwestern, at Louisville, Ky. In 1885 he was made General Freight and Passenger Agent of the Beech Creek, where he remained for 14 years. He then came to the New York Central as division coal agent of the Beech Creek district, and in 1901 was made General Coal Agent of this road and of the West Shore, where he remained until Oct. 1, 1905. He was also General Coal Agent of the Boston & Albany and other New York Central lines. Since the acquisition by the New York Central of the great Beech Creek coal properties, and the railroad extensions into that bituminous coal region, Mr. Herriman has had charge of the commercial development. The problem was not the simple one of mining coal and selling it. In his relations with the other coal carriers, as well as with the users of coal, his work was probably as difficult and delicate as any that comes to a traffic officer. His was the duty of "butting in" with a new supply and a new line, and of course his instructions were to get a fair share of the business and at the same time to avoid war. He succeeded by reason of his thorough knowledge of all the intricacies of the coal business, aided much by his irrepressible humor.

F. E. Herriman.

—Mr. Alexander Robertson, who will become General Manager of the Western Maryland and the West Virginia Central on October 31, was born at Albany, N. Y., in 1860. His first railroad service was in 1885 as brakeman on the Fitchburg. He served consecutively as conductor, general yardmaster, station master and trainmaster until 1897, when he went to the Wabash as general yardmaster. He was later made trainmaster and then Superintendent of the Middle division. In 1903 he was appointed Manager of the Western Maryland and the West Virginia Central & Pittsburg, where he remained until 1904, when he became General Manager of the Terminal Railroad Association of St. Louis, where he is at present.

A. Robertson.

—Mr. C. E. Rickey, who was recently appointed Superintendent of the Cincinnati division of the Cincinnati, New Orleans & Texas Pacific, entered railroad service in the Engineering department of this road in 1883. The next year he went to the Maintenance of Way department of the Alabama Great Southern, where he remained until 1891, when he was appointed chief clerk to the superintendent of that road. Seven years later he was made Assistant Superintendent, and in 1902 became chief clerk to the General Manager of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern. In July of this year he was made Superintendent of Car Service of both companies, which position he leaves to accept his recent appointment.

—Mr. John Cannon, Jr., who has been appointed Superintendent of the Southern Kansas division of the Missouri Pacific, is 33 years old. He began railroad service on the Illinois Central at the age of 14. In 1886 he was employed in the Superintendent's office and remained there in various positions until 1892, when he was made chief clerk to the Assistant Superintendent of the Chicago division. In 1894 he was appointed chief clerk to the Superintendent of the Amboy and St. Louis divisions, and in 1901 chief clerk to the General Superintendent of Transportation. He was appointed assistant trainmaster of the St. Louis division in 1903, and in 1904 was made chief clerk to the General Manager. In January, 1905, he became trainmaster of the Springfield and Chicago divisions, which position he left to go to the Missouri Pacific.

—Mr. Alex. Bonnyman, who is Chief Engineer of the Atlantic & Birmingham and the Atlantic & Birmingham Construction Company, which is building an extension of this road from Montgomery, Ga., to Birmingham, Ala., began railroad work in 1888 as Assistant to the Engineer of Maintenance of Way on the Eastern division of the Newport News & Mississippi Valley Company's lines, now the Chesapeake & Ohio. He later served as rodman and instrument man on the Kentucky Union, now the Lexington & Eastern, and as Resident Engineer, and in the transportation department of the South Bound Railroad, now the Seaboard Air Line. In 1894 he went to the Central of Georgia as Assistant Engineer, and from 1895 to 1898 was roadmaster and engineer of the Chattanooga, Rome & Southern division of this road. In 1899 he was appointed Superintendent of the Atlantic & Birmingham, in charge also of construction, from which position he has been promoted to be Chief Engineer.

—Mr. Edward R. McNeill, Division Engineer of the Grand Trunk Pacific, at Winnipeg, Manitoba, died of typhoid fever on October 7th. Mr. McNeill was born in Iowa in 1866 and attended the University of Iowa from 1884 to 1887. He then began railroad service in the Engineering department of the Rock Island. In 1889 he went to the Northern Pacific as instrument man, and in 1890 was put in charge of the masonry line of the Wicks tunnel, with the title of Assistant Engineer. He resigned in 1894 and engaged in private practice for five years. He returned to railroad work as engineer in charge of construction on the Montana Central. In 1901 he went to the Great Northern as resident engineer on the Middle district, resigning in September, 1903, to become District Engineer of the Grand Trunk Pacific at Edmonton, Alberta. In July of this year he was promoted to his last office, in which he was in charge of 500 miles of location and construction.

ELECTIONS AND APPOINTMENTS.

Chicago & North-Western.—Frank Walters, Superintendent of the Sioux City division, has been appointed Assistant General Superintendent at Norfolk, Neb. E. G. Scheveneli, Superintendent of the Iowa & Minnesota division, succeeds Mr. Walters.

Cincinnati, Hamilton & Dayton.—Charles Steele, Samuel Spencer, George F. Baker, F. D. Underwood and R. R. Rhodes have been elected directors. F. D. Underwood, President of the Erie, has been elected also President of the Cincinnati, Hamilton & Dayton, the Pere Marquette and the Chicago, Cincinnati & Louisville. Russell Harding has been elected Vice-President of these roads, and the Secretary and Treasurer of the Erie have been elected Assistant Secretary and Assistant Treasurer, respectively, of them.

Delaware & Hudson.—A. J. Stone, General Superintendent, has resigned, effective November 1. See Erie.

Erie.—A. J. Stone, General Superintendent of the Delaware & Hudson, has been appointed Assistant to the General Manager of the Erie, with office at New York, effective November 1. George Van Keuren, General Superintendent of the Erie division, at Jersey City, has resigned, effective November 1. R. H. Bowron, General Manager of the Cincinnati, Hamilton & Dayton, succeeds Mr. Van Keuren.

See Cincinnati, Hamilton & Dayton.

Las Vegas & Tonopah—J. Q. Goss has been appointed General Auditor, and Arthur Maguire, Chief Engineer, of this new company, which is a subsidiary of the San Pedro, Los Angeles & Salt Lake.

Pacific.—H. R. Williams, formerly General Manager of the Chicago, Milwaukee & St. Paul, has been elected President of this new railroad in the state of Washington, and A. H. Barkley, Secretary. W. L. Darling, formerly Chief Engineer of the Chicago, Rock Island & Pacific, has been appointed Chief Engineer of the Pacific.

Philadelphia & Reading.—R. J. Stackhouse, Superintendent of the

Wilmington & Columbia division, has been appointed Superintendent of the new Harrisburg division, which is composed of the Lehigh Valley branch, the Philadelphia, Harrisburg & Pittsburg branch, and the Gettysburg & Harrisburg Railway. F. S. Stevens, Superintendent of the Lebanon and Reading divisions, succeeds Mr. Stackhouse. W. H. Keffer, Assistant Superintendent of the Reading division, succeeds Mr. Stevens as Superintendent of the Reading division.

Rio Grande Western.—E. H. Harriman has retired from the board of directors and is succeeded by A. H. Calef.

F. E. Baxter, Division Engineer at Salt Lake City, has resigned, effective November 1.

Wabash.—George Gould has resigned as Chairman of the board, and E. T. Jeffery, President of the Denver & Rio Grande, succeeds him. E. B. Pryor, Assistant to the President, has been elected to the new office of Fourth Vice-President in charge of the Treasury and Accounting departments. A. C. Bird, Vice-President in charge of traffic, has resigned.

W. D. Holliday, Assistant General Freight Agent of this road and of the Wabash-Pittsburg Terminal and the West Side Belt, has resigned.

Wheeling & Lake Erie.—H. T. Douglas, Jr., Consulting Engineer of this road and of the Wabash-Pittsburg Terminal and the West Side Belt, has been appointed Chief Engineer of these three roads, with office at Pittsburg, Pa., succeeding George T. Barnsley, assigned to other duties.

The office of H. J. Booth, General Freight Agent of this road and of the Wabash-Pittsburg Terminal and the West Side Belt, has been moved from Cleveland, Ohio, to Pittsburg, Pa. The office of E. B. Coolidge, Assistant General Freight Agent of the Wheeling & Lake Erie, remains at Cleveland, Ohio.

See Wabash.

Wisconsin Central.—Howard Morris, General Counsel at Milwaukee, Wis., has been elected Vice-President. He will continue to act as General Counsel. George M. Cumming, recently elected a director, has been appointed to the executive committee.

LOCOMOTIVE BUILDING.

The Southern Pacific, it is reported, has ordered 140 locomotives.

The Republic Iron & Steel Co., Chicago, is in the market for two additional locomotives.

The Chesapeake & Ohio, as reported in our issue of October 20, has ordered 35 locomotives from the Richmond Works of the American Locomotive Co.

The Lake Superior & Ishpeming has ordered one locomotive from the American Locomotive Co. and one locomotive from the Lima Locomotive & Machine Co.

The Esser Coal & Coke Company, Esserville, Va., is in the market for a 36-in. gage locomotive having a hauling capacity of at least 25 tons up a 3 per cent. grade.

The Spokane & Inland is reported to have ordered three electric locomotives from the Westinghouse Electric & Manufacturing Co. These locomotives are to weigh 140,000 lbs.

The Illinois Steel Company has ordered three 36-in. gage industrial locomotives from the H. K. Porter Co. The cylinders of these locomotives will measure 16 in. x 20 in.

The Duluth, Missabe & Northern, as reported in our issue of September 22, has ordered six combination freight engines from the American Locomotive Co., and two 10-wheel passenger locomotives from the Baldwin Works.

The Boston & Maine, instead of ordering 10 locomotives, as reported in our issue of October 20, has ordered only two additional locomotives. These, with the 36 locomotives which were ordered in August, make a total of 38 locomotives ordered from the American Locomotive Co.

The Grand Trunk, as reported in our issue of October 6, has ordered 25 locomotives from the Montreal Works of the American Locomotive Co. for May, 1906, delivery. Fifteen of these are of the consolidation freight type with cylinders of the Richmond system of compounding, and the remaining 10 are of the 10-wheel type, with simple cylinders.

The Duluth & Iron Range, as reported in our issue of September 22, has ordered five simple freight locomotives from the Baldwin Works. The freight locomotives weigh 194,000 lbs., with 171,000 lbs. on drivers; cylinders, 22 in. x 28 in.; diameter of driving wheels, 54 in.; straight boiler, with a working steam pressure of 200 lbs.; 321 tubes, 2¼ in. in diameter x 16 ft. long; total heating surface, 3,162 ft.; grate area, 49.5 sq. ft. The tender is provided with a "U" water bottom and has a capacity of 7,000 gallons of water and 12 tons of coal. The special equipment includes: Standard tires, Pittsburg Spring & Steel Co.'s springs, Franklin boiler covering, American balance valves, Simplex injectors, Tower couplers, Schroeder headlights, Westinghouse brakes, National-Hollow brake-beams, Ashton safety valves, Nathan lubricators, United States metallic packing, Ashcroft steam gages, Curren whistles, Leach sanding device and Streeter steel back brake-shoes.

The Canadian Pacific, as reported in our issue of October 20, has ordered 35 locomotives from the Montreal shops of the American Locomotive Co. It has also ordered 15 locomotives from the Canadian Locomotive Co., and 10 locomotives which are to be made at its Angus shops makes a total of 60 engines in all which have been ordered. All of the above are single engines fitted with superheaters, and are of the (4-6-0) type for both passenger and freight service. Deliveries are for December, 1905, and January and February of 1906. These engines are to weigh 190,000 lbs., with 142,000 lbs. on drivers; cylinders, 21 in. x 28 in.; diameter of drivers, 63 in.; boiler, extended wagon top with radial stayed firebox; working steam pressure, 200 lbs.; total heating surface, 2,413 sq. ft. There are 240 tubes 2 in. in outside diameter x 14 ft. 2 in. long, and 22 superheater tubes of 5 in. in diameter x 14 ft. 2 in. long; firebox, 102 in. x 70 in.; grate area, 50 sq. ft.; tender capacity, 5,000 imperial gallons; coal capacity, 10 tons. The special equipment includes: Westinghouse air-brakes, C. P. R. axles, "Little Giant" bell ringers, magnesia section block boiler lagging, Simplex brake-beams, C. P. R. brake-shoes, Washburn pilot and Tower tender couplers, Pyle-National headlights, Hancock injectors, Magnus and Ajax journal bearings, United States metallic piston and valve rod packing, World Brand safety valve, Leach sanding device, Richardson sight-feed lubricators, C. P. R. springs, Star steam gages, Krupp standard and Midvale driving wheel tires, cast-steel truck wheels and wrought-iron disc tender wheels.

The St. Louis, Brownsville & Mexico, as reported in our issue of October 20, has ordered four 10-wheel (4-6-0) locomotives, four simple 8-wheel (4-4-0) and one simple 6-wheel (0-6-0) switching locomotive from the Baldwin Locomotive Works, all for December 15 delivery. The 10-wheel locomotives will weigh 127,040 lbs., with 95,840 lbs. on the drivers; cylinders, 19 in. x 24 in.; diameter of drivers, 62 in.; wagon top boiler, with a working steam pressure of 180 lbs.; 230 iron tubes, 2 in. in diameter and 13 ft. ½ in. long; Otis firebox, 71⅝ in. x 34¼ in.; tank capacity, 4,500 gallons, and oil capacity, 2,500 gallons. The 8-wheel locomotives will weigh 196,000 lbs., with 58,480 lbs. on the drivers; cylinders, 17 in. x 24 in.; diameter of drivers, 62 in.; wagon top boiler, with a working steam pressure of 180 lbs.; heating surface, 1,886 sq. ft.; 187 tubes, 10 ft. 11 in. long; Otis firebox, 69⅜ in. x 34¼ in.; tank capacity, 4,500 gallons, and oil capacity, 2,300 gallons. The switching locomotives will weigh 100,500 lbs.; cylinders, 18 in. x 24 in.; diameter of drivers, 50 in.; straight boiler, with a working steam pressure of 180 lbs.; heating surface, 1,496.3 sq. ft.; 202 iron tubes, 2 in. in diameter and 13 ft. 2 in. long; Otis firebox, 63 in. x 34 in.; tank capacity, 3,500 gallons, and oil capacity, 1,800 gallons. The special equipment for all includes: Tower couplers, Pyle-National electric headlights for 10-wheel and 8-wheel locomotives, Monitor injectors, Ajax journal bearings for 10-wheel and 8-wheel locomotives, Richardson valve rod packings, Baldwin standard safety valves, Leach sanding devices, Detroit sight-feed lubricators, Safety steam heat equipment for 8-wheel locomotives and Midvale driving and truck wheel tires for 10-wheel and 8-wheel locomotives.

CAR BUILDING.

The Western Maryland, it is reported, is in the market for passenger cars.

The Ulster & Delaware has ordered 10 passenger cars from the Pullman Co.

The Coal & Coke has ordered three passenger cars from the Pullman Co.

The Alabama Great Southern, it is reported, is in the market for 250 flat cars.

The Manistee & Grand Rapids, it is reported, is figuring on new freight equipment.

The Chesapeake & Ohio has ordered 500 gondolas from the American Car & Foundry Co.

The Philadelphia & Reading has ordered 1,000 box cars from the American Car & Foundry Co.

The Louisville & Atlantic has ordered 60 freight cars from the American Car & Foundry Co.

The Southern has ordered 114 plain box cars and 198 ventilated box cars from the Lenoir Car Works.

The Interstate has ordered five steel hopper cars of 80,000 lbs capacity from the Pressed Steel Car Co.

The Atlantic Coast Line, it is reported, will shortly order upwards of 1,500 60,000 lbs. capacity box cars.

The Minneapolis & St. Louis has ordered 900 box cars and 100 stock cars from the American Car & Foundry Co.

The Great Northern has ordered 300 steel ore cars of 100,000 lbs. capacity from the American Car & Foundry Co.

The Delaware & Hudson has ordered 2,000 gondola cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Delaware, Lackawanna & Western, it is reported, will shortly be in the market for a large number of freight cars.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 50 refrigerator cars from the American Car & Foundry Co.

The Isthmian Canal Commission has ordered 800 flat cars of 80,000 lbs. capacity from the American Car & Foundry Co.

The Southern Pacific, it is reported, has ordered 600 steel flat cars, 120 passenger and baggage cars and eight observation cars.

The Cold Blast Transportation Company has, it is reported, ordered 200 refrigerator cars from the American Car & Foundry Co.

The New Orleans Great Northern has ordered three 70-ft. coaches, three mail and express cars and one buffet car from Barney & Smith.

The Chicago, Rock Island & Pacific, as reported in our issue of October 6, has ordered 250 furniture cars from the American Car & Foundry Co.

The New York Central Lines are about to order 20,000 freight cars and will shortly place orders for from 6,000 to 7,000 cars in addition to the above.

The Intercolonial has ordered four parlor cars, five combination tourist sleepers and 75 box cars of 60,000 lbs. capacity from the Crossen Manufacturing Co.

The Lake Superior & Ishpeming has ordered 100 steel ore cars of 100,000 lbs. capacity from the Pressed Steel Car Co. These cars are for April, 1906, delivery.

The Atlantic Coast Line has ordered 1,200 box cars and 300 flat cars from the Baltimore Steel Car & Foundry Co., and 15 passenger cars from Barney & Smith.

The Temiskaming & Northern Ontario has ordered three passenger cars, three working cars and one logging and mail car from the Crossen Car Manufacturing Co.

The New York, New Haven & Hartford has ordered 500 flat cars and 500 hopper cars from the Standard Steel Car Co. and 300 cars from the American Car & Foundry Co.

The Louisville & Nashville will build 750 additional box cars at its own shops, and is reported as being in the market for additional passenger equipment, including two dining cars.

The Pittsburg, Binghamton & Eastern is figuring on new equipment, including coal, flat, box and milk cars. The Chief Engineer of the company is J. W. Burke, 45 Broadway, New York.

The Chicago, Milwaukee & St. Paul, as reported in our issue of October 13, has ordered five standard sleeping cars, four tourist sleeping cars, two dining cars and one café car from the Pullman Co.

The Duluth, Missabe & Northern has ordered 200 flat cars and 50 box cars, all of 80,000 lbs. capacity, from the Western Steel Car & Foundry Co., and 25 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Co.

The Erie, it is reported, has just placed a large order for all-steel self-clearing gondola cars with the Standard Steel Car Co. These, it is reported, are in addition to those noted in our issue of September 22 as being ordered from the Pressed Steel Car Co.

The Des Moines, Iowa Falls & Northern has ordered 30 gondola cars of 80,000 lbs. capacity from the American Car & Foundry Co., for November delivery. These cars will be 36 ft. long, 8 ft. 6 in. wide and 3 ft. 9 in. high, all inside measurements. The special equipment includes: Westinghouse air-brakes and Chicago couplers.

The Chesapeake & Ohio has ordered 22 cabooses from the American Car & Foundry Co. The inside dimensions of the cars are 17 ft. 1 in. long x 7 ft. 10 in. wide x 6 ft. 8¼ in. high; over-all dimensions are 23 ft. 8 in. long x 9 ft. ¼ in. wide x 13 ft. 10⅜ in. high. The bodies and underframes are of wood. The special equipment includes: Monarch brake-beams, Christie brake-shoes, Climax couplers and Miner tandem draft gear.

The Baltimore & Ohio, as reported in our issue of October 6, has ordered 10 horse express cars from the Pullman Co., for November 15 delivery. These cars will weigh 45,000 lbs., and measure 70 ft. 11¾ in. long, 10 ft. 1¼ in. wide and 14 ft. 6 in. high, over all. The special equipment includes: Baltimore & Ohio standard brake-beams, brake-shoes, brasses, door fastenings, dust guards, paint, springs and trucks, Westinghouse air-brakes, Miner tandem draft rigging, McCord journal boxes and Pintsch light.

The New York, Ontario & Western, as reported in our issue of October 20, has ordered 10 passenger cars from Harlan & Hollingsworth for April, 1906, delivery. These cars are fitted with wide vestibules and weigh about 100,000 lbs. They are 64 ft. long inside and have a seating capacity of 75 passengers. The bodies and underframes are of wood. The special equipment includes steel axles; Commonwealth double body bolsters, National hollow brake-beams, American brake-shoes, Westinghouse brakes, Gould couplers, Curtain Supply Co.'s curtain fixtures, Pantasote curtain material, Gould friction draft rigging, Symington journal boxes, the Safety Car Heating & Lighting Co.'s Frost system of lighting, Gould wide vestibules, and Railway Steel Spring Co.'s wheels.

The Tramway Rural & Vapor, of Buenos Ayres, Argentine Republic, as reported in our issue of October 20, has ordered 85 Brill patented grooveless-post semi-convertible cars from the J. G. Brill Co. Seventy-five of these cars are for city service and are mounted on the Brill type of single truck, No. 21-E. These cars measure 21 ft. 4 in. over the bodies and 30 ft. 4 in. over the vestibules; width over sills, 7 ft. 10½ in., and over posts at belt, 8 ft. 2 in. The remaining 10 cars are mounted on Brill No. 27-E-1 high-speed trucks, and are for use on a division extending for several miles out of the city. The length of these cars is 31 ft. over the bodies and 41 ft. over the vestibules; width over sills, 8 ft. ½ in., and over posts at belt, 8 ft. 2½ in. The shorter cars have a seating capacity of 32 and the longer cars seat 44 passengers. The seats are of Brill make and have step-over backs. All of the cars have the interior finished in mahogany and the vestibules are stationary and provided with folding-doors with Brill patented controlling device.

The Pennsylvania has just ordered 10,000 class Gsd all-steel drop bottom gondolas, 5,000 class Gla all-steel self-clearing hopper gondolas, and 5,000 class XL box cars, making in all 20,000 freight cars. The order was distributed as follows: Pressed Steel Car Co., 12,000 cars, including 2,500 class Gla all-steel self-clearing hopper gondola cars for the lines west of Pittsburg, 5,500 class Gsd all-steel drop bottom gondola cars and 4,000 XL box cars for the lines east of Pittsburg, 1,000 of the latter are to be made at the works of the Western Steel Car & Foundry Co.; American Car & Foundry Co., 3,100 cars, including 2,500 class Gla all-steel self-clearing gondola cars for the lines west of Pittsburg, and 600 class XL box cars; Standard Steel Car Co., 2,000 class Gsd all-steel drop bottom gondola cars; Cambria Steel Co., 2,500 class Gsd all-steel drop bottom gondola cars, and Middletown Car Co., 400 class XL box cars. These cars will all be of 100,000 lbs. capacity, and the box cars will have steel underframes and American Railway Association standard inside dimensions. Deliveries will begin in March, 1906. This is probably the largest single car order ever placed by any one road. The above order is in addition to the large order for 16,160 cars placed by the Pennsylvania which was reported in our issue of October 13.

The Central of Georgia, as reported in our issue of September 15, has ordered 450 box cars of 60,000 lbs. capacity from the South Atlantic Car & Manufacturing Company, 500 steel hopper coal cars of 100,000 lbs. capacity from the Pressed Steel Car Co., and 400 wooden flat cars of 60,000 lbs. capacity from the Pullman Co. The box cars will measure 36 ft., and the special equipment includes: Westinghouse brakes, Simplex brake-beams, Tower couplers, Butler tandem drawbar attachments, Railway Steel Spring Co.'s springs, Symington journal boxes and dust guards, Murphy's improved Winslow roofs, Jones' door fixtures, Lappin or Herron brakes, and Sherwin-Williams paint. The coal cars will measure 31 ft. 10 in. long, and the special equipment includes: Arch-bar trucks, Simplex truck bolsters, Westinghouse brakes, Simplex brake-beams, Tower couplers, Miner tandem drawbar attachment, Railway Steel Spring Co.'s springs, McCord journal boxes, Ajax journal bearings, Susemihl side bearings and Dunham door fastenings. The wooden flat cars will measure 40 ft. long and the special equipment includes: Andrews cast-steel trucks, Simplex bolsters and brake-beams, Westinghouse brakes, Janney couplers, twin spring drawbar attachment, Railway Steel Spring Co.'s springs, Gould journal boxes, Camel journal bearings and Hartman side bearings.

BRIDGE BUILDING.

BEAUFORT, N. C.—The Beaufort & Western Railway Co., recently organized, will build a bridge between this place and Morehead City. F. L. Merritt is President; R. F. Foster, Vice-President, and M. Manly, Secretary and Treasurer.

DES MOINES, IOWA.—The City Council has passed a resolution authorizing the City Engineer to prepare plans for a reinforced concrete bridge to be built over the Des Moines river on Locust street.

The proposed bridge will be similar to the new one now under construction on North Sixth street.

Edmonton, N. W. T.—The Canadian Northern is building a temporary timber bridge over the North Saskatchewan, with approaches 5,400 ft. long on the permanent concrete piers, which will be replaced early next year by a permanent steel structure.

Guelph, Ont.—The Township Council will build a new steel bridge to replace the Caraher's bridge.

Guthrie, Ky.—Bids are wanted by F. M. Duffy for building an iron bridge 50 ft. long, in Taylor County.

Mattawa, Ont.—The Ontario Government will build a steel bridge here to cost about $9,000.

Milwaukee, Wis.—Application has been made by the Park Board for an appropriation of $15,000 to build a bridge over the North-Western tracks, which have been depressed at Riverside Park. The railroad company has completed the retaining walls which will serve as abutments.

Minneapolis, Minn.—The Great Northern is planning to build a steel bridge over its tracks at Superior avenue to replace the present wooden structure.

Portage La Prairie, Man.—The Canadian Northern has plans ready for building a steel swing span bridge 150 ft. long over the Assiniboine river four miles east of this place.

Portland, Ore.—According to reports, the Northern Pacific has decided to build a bridge 160 ft. above high water over the Willamette river south of the Portland drydock.

Shawinigan Falls, Que.—The Saint Maurice Valley Railroad, which is building a road through this place, will build a bridge 300 ft. long over the Saint Maurice gorge.

Stratford, Ont.—Plans have been filed by the Canadian Pacific for its proposed bridge to be built on its branch from Goderich.

Sussex, N. B.—The People's Railway Co., it is said, is planning to put up a large steel bridge at this place.

Victoria, B. C.—T. W. Paterson, M. P. and President of the Board of Trade, is promoting the building of a steel bridge from Vancouver Island to the mainland.

Woodville, Miss.—At a recent meeting of the Board of Supervisors, a bond issue of $9,800 was authorized for building a steel bridge over Buffalo bayou at Murray's ferry, in Wilkinson County.

Other Structures.

Bamberg, S. C.—The Southern Railroad station and platforms, together with a number of freight cars and stores, were destroyed by fire October 13; loss, about $50,000.

Indianapolis, Ind.—Plans have been completed to at once build additions to the union station, at a cost of $75,000.

Grand Rapids, Mich.—The Grand Trunk, it is said, will shortly ask for bids for putting up a new passenger station two stories high, 80 x 80 ft., to cost $50,000.

Oakmont, Pa.—The Pennsylvania will soon ask bids for putting up a brick passenger station 200 ft. long, to cost about $25,000.

Pawnee City, Neb.—Bids are wanted November 14 by George L. Lore, County Clerk, for putting up all the bridges that may be needed in Pawnee County for one year.

Sheboygan, Wis.—The West Side Belt Line has been given a franchise which insures the building of a new passenger station to cost $72,000 and a new freight house to cost $80,000.

Sioux City, Iowa.—The Great Northern, it is said, has recently bought 82 acres of land on which it will put up new shops.

Wetaskiwin, Alberta.—The Canadian Pacific, it is said, will put up a new station here to cost $25,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Anderson & Saline River.—This company, which was incorporated some time ago in Arkansas, has increased its capital from $20,000 to $56,000. It is to build a railroad from Clio, in Cleveland County, Ark., southwest for a distance of 18 miles. The incorporators include G. W. Richie, of Pine Bluff, Ark., and others. (See Construction Record.)

Atlantic City & Shore.—Articles of incorporation have been filed by a company under this name in New Jersey to build a railroad in Atlantic County. The incorporators include: J. F. Cotter, of Philadelphia; G. H. B. Martin, George C. Duval, J. H. Switzer and others, of Camden, N. J.

Beaumont & Great Northern.—An officer writes confirming the report that grading has been commenced by Lamb & Hansen, contractors, of Trinity, Tex., on this proposed road from Trinity southeast to Livingston, about 30 miles. The work is easy, the maximum grades being only 1 per cent., with a curvature of 3 degrees, and only two steel bridges will be required. Track laying is to begin early next month. William Carlisle, of Atchison, Kan., is President, and C. A. Noblett, Chief Engineer, Trinity, Tex. (Sept. 29, p. 102.)

Buffalo & Susquehanna.—The extension of the main line of this road from Dubois, Pa., south to Sykes, a distance of 6.9 miles, has been opened for freight traffic; also an extension of the Wellsville branch from Wellsville, N. Y., north to Belfast, 19.6 miles.

Canadian Northern.—This company is grading its new cut-off west of Winnipeg to connect the Portage la Prairie with the Hudson Bay branch.

Chesapeake & Ohio.—The Big Sandy branch has been extended from Pikeville, Ky., south to Regina, 16 miles.

Chicago & North-Western.—See Wyoming & North-Western below.—See Pierre, Rapid City & North-Western below.

Chicago, Burlington & Quincy.—An officer writes that contracts have been let by the C., B. & Q. to Guthrie & Co., of St. Paul, Minn., for building its proposed extension from Frannie, in the northern part of Big Horn County, Wyo., southeast through Lovell and Basin to Wellington, and thence south to Worland, about 85 miles. The work includes the building of three steel bridges and the excavation of about 22,000 cu. yds. to the mile, 16 per cent. of which will be rock. The maximum grades will be 16 ft. to the mile. (October 13, p. 118.)

Chicago, Indianapolis & Evansville.—A company has been formed in Indiana by L. Wallace, O. B. Jamieson, I. N. Ritchie, S. M. Smith and others, of Indianapolis, with a capital of $325,000, which, they say, is for the purpose of building a railroad from Evansville to Indianapolis and Indiana Harbor, Ind.

Chicago, St. Paul, Minneapolis & Omaha.—This company is planning to improve its road from Le Mars, Iowa, north to Alton. The present line, which is 16 miles long, will be straightened and grades reduced.

Coal Belt.—Surveys have been completed by this company, which was incorporated in Utah to build a railroad from Spanish Fork, Utah, through Utah, Wasatch and Carbon Counties to the coal fields, a distance of 89 miles. Construction work will be commenced during the winter. Contracts have not as yet been let. The maximum grade will be 2 per cent. and the maximum curvature, 10 degrees. S. B. Milner is President, and F. P. Jacobs, Chief Engineer, Salt Lake City, Utah.

Colorado, Oklahoma Central & New Orleans.—See Guthrie, Fairview & Western below.

Darien & Western.—This road has opened its extension from Ludowici, Ga., west to Weefannie, five miles, for freight traffic.

Dawson Springs & Madisonville.—Incorporation has been granted a company under this name in Kentucky, with a capital of $100,000, to build a railroad in Hopkins County, Ky., from Dawson northeast to Madisonville, 20 miles. The incorporators include: W. G. Harris, A. Haydon, W. J. Powell and L. Haydon, all of Hopkinsville. The offices of the company will be at Madisonville.

Decatur, Sullivan & Mattoon.—This company has been organized at Sullivan, Ill., with a capital of $600,000, and will ask for incorporation to build an interurban road from Decatur, Ill., to Mattoon, passing through Mount Zion, Dalton City, Bethany, Sullivan and Coles. At Decatur, connection will be made with the present interurban road to Springfield and St. Louis, and with the line now building to Clinton and at Mattoon with the road to Charleston. The board of directors includes: J. M. Clokey and Felix B. Tait, of Decatur; A. R. Scott, of Bethany; G. B. Spitler, of Mount Zion; J. H. Uppendahl, of Dalton City; W. A. Steele and J. B. Titus, of Sullivan; R. B. Starbuck and E. C. Craig, of Mattoon.

Denver, Northwestern & Pacific.—The extension of this road, recently opened, runs from Arrowhead, Colo., west to Sulphur Springs, a distance of 32.5 miles. (Sept. 22, p. 95.)

Dubuque, Iowa & Wisconsin.—This company has been organized in Iowa to build a railroad from Dubuque through Iowa, Illinois and Wisconsin to points not yet decided upon. The directors include: J. M. McFadden, A. W. Tredway, F. J. Piekenbrock, H. H. Blish, J. E. Hedley and others.

Gainesville Midland.—An officer writes that work will shortly be begun on the extension from Jefferson, in Jackson County, Ga.,

southeast to Athens, in Clark County, a distance of 18 miles. Contracts will probably be asked for the work about Nov. 1. (October 13, p. 119.)

GREAT NORTHERN.—The work carried out by this company and subsidiary lines during the past year and at present under construction includes the building by the Dakota & Great Northern, a line from a junction with the main line at York, N. Dak., to Thorn, 34.35 miles; from a junction with the main line at Towner, N. Dak., to Maxbass, 45.89 miles, both of which were opened for operation August 1; extension of line from Westhope, N. Dak., to Antler, 12.75 miles, opened August 25, and an extension of line from Munich to Sarles, 20.53 miles, opened October 3; the Washington & Great Northern and the Vancouver, Victoria & Eastern, are together to form a line from the international boundary at Midway via Molson and Oroville to Keremeos, B. C., 96 miles. The 49 miles in the United States are being built by the Washington & Great Northern, and the 47 miles in British Columbia by the V., V. & E., which already has 30 miles of line in British Columbia. The latter company has also located an extension from Keremeos to Princeton, 40 miles, on which work will soon be started.

The Minnesota & Great Northern has begun work on an extension of its line from Greenbush to Roseau, Minn., 22 miles, which will be opened for operation during the present year.

The Dakota & Great Northern is now building a line from Ellendale, N. Dak., west to Forbes, 13.4 miles, which will be completed in time to move this year's crops.

GUTHRIE, FAIRVIEW & WESTERN (K. C., M. & O.).—Persons said to be interested in this company, which is building a line from Fairview, Okla. T., southeast via Kingfisher to Guthrie, a distance of about 100 miles, have recently incorporated two companies in Oklahoma Territory; one, under the name of the Colorado, Oklahoma Central & New Orleans, with a capital of $20,000,000, to build a railroad from Denver, Colo., south to Trinidad, thence southeast crossing a corner of New Mexico, through Beaver, Woodward, Day, Dewey and Blaine Counties to Fairview, in Woods County, on the Kansas City, Mexico & Orient, about 520 miles, connecting at the latter point with the Guthrie, Fairview & Western. The other company, under the name of the Guthrie, Shawnee & Shreveport, has been incorporated with a capital of $9,000,000, to build from the eastern terminus of the Guthrie, Fairview & Western at Guthrie, southeast through Logan, Lincoln, Oklahoma and Pottawatomie Counties, in Oklahoma Territory, and the Creek, Seminole, Chickasha and Choctaw nations, in Indian Territory, through the eastern part of Texas to Shreveport, La., approximately 350 miles. All of these new lines, it is said, are being built for the Kansas City, Mexico & Orient, and when completed will give that road a through connection from Denver to Shreveport. The incorporators of the new roads are: W. S. McCaull, of Joliet, Ill.; G. E. Smith, J. G. Trimble, L. Underwood and G. F. Riehl, of Kansas City; G. C. Cowles, of Darrow; Don Carlos Smith and F. L. Williams, of Guthrie. The headquarters of the company will be at Guthrie.

GUTHRIE, SHAWNEE & SHREVEPORT.—See Guthrie, Fairview & Western above.

KANSAS CITY, MEXICO & ORIENT.—See Guthrie, Fairview & Western above.

LOUISVILLE & NASHVILLE.—This company is reducing the grade on its old line between Corbin and Saxton, Ky., on the Knoxville division, and between Knoxville and Etowah, Tenn., on the Atlantic division. The company is building a new low grade line from Etowah to Cartersville, Ga., where connection will be made with the Western & Atlantic, over whose tracks the company has trackage rights to Marietta. When these works are completed the company will have a good direct line from Cincinnati to Atlanta, a distance of about 485 miles, with reduced grades from Corbin to Atlanta.

MISSOURI PACIFIC.—An officer writes regarding the proposed extension of this road from Atchison, Kan., to St. Joseph, Mo., that no authority for this work has yet been given. The company has bought land in the city of St. Joseph for freight terminal facilities, which will be improved as required. The company at present runs trains over the Burlington tracks between Atchison and St. Joseph. (September 29, p. 103.)

NASHVILLE INTERURBAN.—An officer writes that this company is considering the question of using gasolene as motive power. The proposed line is to run from Nashville, Tenn., south through Brentwood to Franklin, about 21 miles. Construction work is to begin early in November; contracts have not as yet been let. The work is very easy, the maximum grades in the city being 5 per cent. and out of the city 2 per cent., with a maximum curvature of 10 deg. outside of the city. There will be one steel or concrete steel bridge over the Harpeth river at Franklin. Major E. B. Stahlman is President, and Charles S. Brown, Chief Engineer, Nashville, Tenn. (September 8, p. 79.)

NEW YORK CENTRAL & HUDSON RIVER.—Surveys are being made by this company in Brewster, N. Y., for proposed double-track work on the Harlem division. The double track at present extends from New York north as far as Goldens Bridge and will be extended to Brewster, 8.3 miles. The most difficult work on this section is between Brewster and Croton Falls, where several large cuts will have to be made and many fills. One bridge will have to be rebuilt. The work will be completed in about a year.

NEVADA & CALIFORNIA.—This road, formerly the Carson & Colorado, has been extended from Fort Churchill to Hazen, Nev., 28 miles, and has been made standard gage from Hazen to Mina. Between the latter place and Keeler the narrow gage is still used.

See Railroad Corporation News.

NORTHERN PACIFIC.—The Fargo & Southwestern branch has been extended from Edgeley, N. Dak., on the Dakota division, west to Gackle, 30 miles.

NORTH YAKIMA VALLEY.—A contract has been given by this company to Allen & Mathieson for grading part of its proposed road through Naches Pass, in the Yakima Valley. The company expects to have 15 miles of its road finished this year. George Donald, of North Yakima, Wash., is interested.

PACIFIC RAILROAD.—Incorporation has been granted a company under this name in Washington with a capital of $3,000,000 to build a railroad from Seattle southwest to Wallula, Wash. The air line distance between these two places is 200 miles. The new company has taken over the tidewater lands recently bought in the name of James T. Woodward, President of the Hanover National Bank, New York, and it is reported that the new road will form the western end of the Chicago, Milwaukee & St. Paul. H. R. Williams, formerly General Manager of the Chicago, Milwaukee & St. Paul, is President, and W. L. Darling, Chief Engineer. (See Elections and Appointments.)

PAWNEE RAILROAD.—An officer writes that this road, which operates a line from Auburn, in Sangamon County, Ill., east nine miles to Pawnee, has given contracts to Johnston & Grommett Bros., of Afton, Ill., for grading and track work, and to the Wisconsin Bridge & Iron Co., of Milwaukee, Wis., for the steel bridges for extending its road from Pawnee southeast, 16 miles, to Taylorville, which is on the Baltimore & Ohio and the Wabash.

PIERRE, RAPID CITY & NORTH-WESTERN (C. & N.-W.).—This company, which was recently incorporated in South Dakota to build a railroad from Pierre, S. Dak., west through Stanley and Lima Counties to Rapid City, S. Dak., 165 miles, has given the contract to Winston Bros. Co., of Minneapolis. (September 29, p. 103.)

REDBLUFF & FALLRIVER.—Articles of incorporation have been filed by this company in California, with a capital of $1,000,000, to build a railroad from Redbluff, on the Southern Pacific, northeast via Shingletown to Fallriver mills, about 40 miles. The directors include: D. L. Miles, E. R. Walbridge and H. P. Stice, of Redbluff; P. E. Vilas and A. Thacher, of Shingletown; S. Leavett; of San Francisco; O. P. Montelius, of Oakland, and others.

SHREVEPORT & NORTHEASTERN.—This company, recently granted a charter in Louisiana to build a railroad from Shreveport northeast to Memphis, Tenn., a distance of about 275 miles, has, it is said, completed surveys from Shreveport to Homer, and obtained nearly all the rights of way. Grading is now in progress between Minden and Homer, and contracts for track laying will be let early next year. (September 15, p. 88.)

SOUTHERN PACIFIC.—This company has begun work on a branch from Santa Cruz, Cal., to Davenport, on the coast, 22 miles. The new line may eventually be extended along the coast north to San Francisco, paralleling the Ocean Shore electric road, which is now being built over the same route.

See Nevada & California above.

TEXAS, NEW MEXICO & PACIFIC.—An officer writes that this company, which was recently granted a charter in Texas, has given the general contract to the Rock Island Construction Co., First National Bank Building, Chicago, and is making surveys for its proposed road. The line is to run from McKinney, in Collin County, Tex., west by northwest through Denton, Decatur, Bridgeport, Graham, Belknap, Haskell, Rayner, Espuela, Emma and Lubbock, in Texas, west to Roswell, N. Mex., about 500 miles. The company will build a number of towns along the proposed route, and grading contracts will be let as soon as the surveys are completed. The work will be easy. There will be six important steel bridges. Jesse Shaine is President, and M. J. Healy, General Manager, McKinney, Tex. (October 13, p. 119.)

TULSA, TEXAS & GULF.—Application has been made by L. Howard Lee, of Oklahoma City, for a charter for this company, with a capital of $10,000,000, to build a railroad from Matagorda Bay, Tex., north to Oklahoma City, Okla. T., and Tulsa, Ind. T., about 600 miles. The directors include: M. H. Smythe, Gainesville, Tex.; H. V. Pentecost, Guthrie; J. W. Helt and M. S. Lee, Oklahoma

City; D. D. Merry, Roswell, N. Mex.; Warren K. Snyder and L. Howard Lee. The promoters say that financial backing for the enterprise has been secured and that construction will soon be started.

Wallula Pacific.—This company, which was recently granted a charter in Washington to build a railroad from Wallula to Vancouver, Wash., it is said, has completed surveys for about 115 miles, and contracts will be let in about four weeks. (August 25, p. 63.)

Waynesburg Southern.—A charter has been granted a company under this name in Pennsylvania, with a capital of $120,000, to build a railroad in Green County, Pa., from Waynesburg south to the state line, a distance of 12 miles. Thomas F. Barrett, of Pittsburg, is President. The directors include: E. McSweeney, of Pittsburg; A. I. Cook and E. Barrett, of Waynesburg, and others.

Western Pacific.—This company has given a contract for building its proposed line from Oakland north to Oroville, in Butte County, Cal., to H. H. Huston, of Tacoma, Wash. (October 13, p. 119.)

Wichita Valley Railroad.—This company, which was recently incorporated in Texas with a capital of $200,000, by Col. Morgan Jones, of Taylor County; N. Harding, George Thompson, and others, of Fort Worth, and of which B. F. Yokum and Edwin Hawley, of New York, and Frank Trumbull, of Denver, are directors, will take over the Wichita Valley Railway. The road extends from Byers to Seymour, Tex., 75 miles. The new company will build an extension from Seymour southwest through Knox and Haskell Counties, to Stanford, in Jones County, about 60 miles. The road connects with the Fort Worth & Denver City (Colorado & Southern), and it is expected that the C. S. will soon take over the control.

Windsor, Essex & Lake Shore (Electric).—An officer writes that this company, which was recently granted a charter in Michigan, will build an electric railroad from Windsor, Ont., touching Essex, Kingsville, Leamington, Wheatley, Tillsbury and Chatham, with a short line from Tillsbury to Essex. Construction work has been commenced by the Keystone Construction Co., of Philadelphia, which has the contract; but no track has yet been laid. The maximum grade will be 2 per cent. The work includes the building of one steel bridge. W. L. Wilson, Port Huron, Mich., is President, and P. Haseltine, Detroit, Mich., is Manager. (October 13, p. 119.)

Wyoming & North-Western (C. & N.-W.).—A contract, it is reported, has been let to the Kilpatrick Bros. & Collins Contracting Co., of Beatrice, Neb., for building this road, which is an extension of the Chicago & North-Western, from Casper, Wyo., across the Shoshone Indian reservation to Lander. (See Construction Record.)

RAILROAD CORPORATION NEWS.

Alabama Great Southern.—The annual report for the year ended June 30 shows net earnings of $601,325, a decrease of $23,600 as compared with last year. The gross earnings were $3,308,300, an increase of $208,855. The net income was $324,984, an increase of $4,372, leaving a surplus after dividends of $139,547; equal to 1.8 per cent. earned on the $7,830,000 common stock.

Buffalo, Rochester & Pittsburg.—See Lake Shore & Michigan Southern.

Bush Terminal.—This New York City company has sold to F. J. Lisman & Company, of New York, $1,500,000 5 per cent. gold bonds of 1955, making $4,250,000 outstanding of the total issue of $10,000,000.

Carolina Northern.—This road, which has been in the hands of a receiver for some time, has been sold, under order of the court, to a committee of bondholders, of which Howard S. Graham, of the firm of Graham & Company, bankers, Philadelphia, is Chairman. The consideration is said to have been $268,000. (September 1, page 72.)

Chicago Terminal Transfer.—Nearly all the bonds and a large amount of the stock of this company have been acquired by the Hill interests. This company owns 84 miles of road and leases and has trackage rights over 17 miles more. There are $15,140,000 first mortgage 4 per cent. bonds of 1947 outstanding, and the capital stock consists of $17,000,000 4 per cent. non-cumulative preferred stock and $13,000,000 common stock.

Cuba.—The Cuban Congress has passed a bill authorizing the payment to the Cuba Railroad Company of $798,450. The first instalment, amounting to one-third of this sum, has already been paid, and the rest will be paid in two equal instalments on December 15 of this year and on December 15, 1906. The railroad is to repay this loan, without interest, in instalments within ten years, beginning December 15, 1906.

Illinois Central.—See Tennessee Central.

Lake Shore & Michigan Southern.—This company has arranged with the Buffalo, Rochester & Pittsburg for trackage rights over the B., R. & P. from Falls Creek, Pa., to Clearfield, 32 miles. This makes unnecessary the construction of this length of road on the Lake Shore's new Franklin and Clearfield road, which is being built to connect with the Beech Creek division of the New York Central.

Lehigh Valley.—This company has sold to Drexel & Company $7,000,000 collateral trust 4 per cent. bonds, which is part of an authorized issue said to be $19,000,000. These bonds are to be secured by pledge of the stock of Coxe Bros. & Company and of the Delaware, Susquehanna & Schuylkill. (Oct. 20, page 128.)

Mobile, Jackson & Kansas City.—This company has sold $4,000,000 of its first consolidated mortgage 5 per cent. bonds of 1953, which is the total amount outstanding, and $4,000,000 first mortgage 5 per cent. bonds of the Gulf & Chicago, the principal and interest of which are guaranteed by the M., J. & K. C., which controls and leases the road.

Nevada & California.—This company has taken over the 300 miles of road owned and operated by the Carson & Colorado. The Southern Pacific Company, of which the Nevada & California is a subsidiary, owns all of the $4,380,000 capital stock of the Carson & Colorado and also the $2,000,000 4 per cent. bonds outstanding.

Norfolk & Western.—On October 25, the directors declared a semi-annual dividend of 2 per cent. on the $66,000,000 common stock, thus putting it on a 4 per cent. basis. Since 1903 this stock has received 3 per cent. The first dividend was in 1901, when 2 per cent. was paid, and this was increased to 2½ per cent. in 1902. An issue of $2,000,000 car trust certificates was authorized at this week's meeting, also.

Pacific Coast.—This company has sold to Blodget, Merritt & Company $554,000 first mortgage 5 per cent. bonds of 1946, which is the entire amount authorized.

Pennsylvania.—The Philadelphia stock exchange has listed $100,000,000 3½ per cent. 10-year convertible bonds. (Oct. 6, page 112.)

Pullman Company.—At the annual meeting on October 19, the following directors were elected: Marshall Field, O. S. A. Sprague, Henry C. Hulbert, Robert T. Lincoln, Norman B. Ream, William K. Vanderbilt, J. Pierpont Morgan, Frederick W. Vanderbilt, W. Seward Webb and Frank O. Lowden.

The total revenue for the year was $26,922,023. The total expenses of operation were $13,884,983; depreciation on cars and reserve for depreciation on all the property of the company, $2,331,476; dividends declared, $5,919,982; proportion of net earnings of cars paid to associated interests, $651,010; leaving a net surplus of $4,134,572. The net assets of the company are $96,151,946, of which $74,000,000 is represented by capital stock and $22,151,946 is surplus, the latter $4,134,571 more than a year ago.

The number of passengers carried during the year was 14,969,219, and the number of miles run by cars was 444,986,296; passengers the previous year, 13,312,668; car miles, 408,234,382; showing an increase of over 12 per cent. in the number of passengers carried, and over 9 per cent. in the number of miles run. There were 184,147 miles of railroads covered by contracts for the operation of Pullman cars.

The value of the manufactured product of the car works of the company for the year was $16,512,387, and rentals amounted to $289,108, a total of $16,801,495, against $23,142,760 for the previous year. The average number of names on the pay rolls at Pullman for the year was 5,681, and wages paid $3,667,936, making an average annual wage of $645.65 for each person employed. In all departments the total number of persons in the employ of the company was 18,901, and wages paid during the year were $11,186,200. The number of employees for the previous year was 20,355, and the wages paid, $12,570,914.

Southern.—See Tennessee Central.

Tennessee Central.—The Standard Trust Company of New York, acting for the Southern and the Illinois Central, has taken a three-year option on a controlling interest in the stocks and bonds of the Tennessee Central and the Nashville Terminal.

United Railways of Havana.—This company has acquired the Cardenas & Jucaro, which is 211 miles long, at a premium of 25 per cent. on each share, payable half in bonds and half in stock of the United Railways at par value.

Western Pacific.—A meeting of the stockholders has been called for November 9 to authorize an issue of $25,000,000 second mortgage bonds. Fifty millions of first mortgage bonds have been already issued and it is not expected that this new amount will be issued for some time, and perhaps not at all.